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Scientifiction Stories by:

Aladra Septama

John W. Campbell, Jr.

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CONTENTS

Prize Editorial (What Scientification Means to Many) 435
By James E. Suiter

A Modern Prometheus
By Cyril G. Wates
Illustrated by Wesso

The Black Star Passes 492
By John W. Campbell, Jr.
Illustrated by Wesso

Boomeranging 'Round the Moon 524
By David H. Keller, M.D.
Illustrated by Morey

Terrors of Arelli 530
By Aladra Septama
Illustrated by Wesso

Dr. Immortelle 560
By Kathleen Luckwick
Illustrated by Morey

The Triple Ray 570
By R. V. Happel

Editorials from Our Readers 575

Your Viewpoint 576

Our Cover

Illustration by Morey

The cover of this issue depicts an unexpected development during a battle with the enemy, taken from the story entitled, "The Black Star Passes," by John W. Campbell, Jr.

October 20, 1930

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What Scientifiction Means to Man

By James E. Suiter

MAN exists. Why or to what end, we know not. Scientifically we refer to him as the Genus Homo; the highest form of life that has evolved from that basic element of all living matter—protoplasm.

For years Man has struggled against the aggressive forces of Nature. It would now seem he has conquered. The Earth bows itself at his will. He is the ruler supreme—on his own world.

Ten million years till the sun dims itself to a dull glow, and goes out. So say the astronomers. Ten million years for Man to fling off his mundane bonds and leave a doomed world behind. Ten million years in which to attain the peak of his earthly destiny. Will he do it? When the sun has changed to a red-glowing mass in the heavens—will he then be able to leave his ancient home—to follow out a chosen future on some distant star? That question lies with us of today.

This old world is weary of war. It is ready to do practically anything to abolish Mars from his pedestal. Another war and it will be glad to do everything. So, as things now run, the armies and navies of the world will have ceased to exist within fifty years. A hundred years will see the nations of the earth under the rule of a single political system. The manufacture of death-dealing weapons will have long been forgotten. Man may stop at this height of culture or go soaring to undreamt heights. These are things for the evolutionists to settle. And now man has those ten million years in which to advance his civilization and, mayhap, to people the seven (now eight) remaining planets of the solar system.

But what of the decillion or more other planets circling the distant stars, what of the life on them? Suppose a civilization dwelling on one of these takes the offensive against this Man of the future. There could be but one result: Man would simply cease to exist. And considering the fact that he would be without the simplest weapons of warfare, what more could one expect? A sudden attack out of the blackness of space, the metropolises of the world destroyed, and the final hunting down of the few remaining remnants of humanity: that would be the inglorious result of a preceding neglect.

Such a catastrophe may seem a little too distant, or so novel that the mind can not at first realize it. But cold reasoning, accompanied by the activities of one's imagination, will show it as not only being quite possible, but also with the odds greatly in its favor. And now let us see how readily scientifiction fits into this case.

An appeal made to the nations of the world at the present time to retain their armaments on the grounds that such a disaster might happen to their descendents would be laughed at as foolish imaginings. But let us suppose that in the field of literature scientifiction is as well known and as widely read as, for instance, the modern detective novel. Think of the wholly different light in which the possibility would be regarded. No longer would it seem something hopelessly imaginary, but a concrete reality, a thing which had been encountered and solved countless times in one's explorations into the realms of scientifiction.

Nor does the utilitarian value of scientifiction necessarily cease here. There are countless other examples of its benefits to humanity. Let me enumerate one more of these, a little reminiscent of the first, perhaps, but to some more realistic.

The statement of Dr. L. O. Howard, former Chief of the Bureau of Entomology of the United States Department of Agriculture, that the day would come when Man would go down in hopeless defeat before the insect hordes, meant little to the average citizen. But to those who have read scientification, there was a grim meaning in those words. They had read of such situations, and knew and could fully realize the momentum of that pregnant warning.

In conclusion I can say that it is only to be feared that scientifiction has come to Man too late to fully save him from the ever-impending attacks of Nature, which are now gathering on the horizon of his existence. But even so, it stands out against the black background of Fate as a flaming torch, symbolizing that greatest of human forces, whispered of in all ages—*Hope*.

PRIZE WINNER

James E. Suiter,
751 Bergen Avenue,
Jersey City, N. J.

(See page 575)

The Next Issue of the Quarterly Will Be on the Newsstands January 20th

A Modern Prometheus

THE early alchemists devoted much of their energy to the transmutation of metals. In experimenting in this direction, by the most empiric methods, they did develop a lot of chemistry, but were deplorably lacking in theory. Strange things are going on in the series of the elements, and it may be that chemists are now on the verge of transmutation. Any approaches to it, curiously enough, lie among the metals. Allotropism brings us pretty near to transmutation, for, to take a classic example, by subjecting the beautiful diamond to intense heat it can be converted into precisely the same weight of unattractive coke. The changing of one form of carbon into another, diamonds into coke, certainly comes pretty close to the goal. It does not seem impossible, therefore, that chemists may, within a few years, carry out the dream of the alchemist. But when that dream is realized—what then? Mr. Wates, who was first introduced to AMAZING STORIES *as the prize winner in our first cover contest, has consistently maintained his original high standard of scientific fiction, and in this story, "A Modern Prometheus," brings us not only entertainment and science, but also instructive information in diversified fields. It is an excellent complete science novel.*

Prologue

HIGH on the Palisades, which guard the Hudson River, stood a great house. Every detail of its architecture, every feature of its environment, gave evidence of wealth, combined with a keen sense of beauty and artistic fitness, as admirable as it was rare, in the nineteenth and twentieth centuries. Perhaps the building or its extensive grounds might not have found favor in the eyes of the idle rich of those times, hidebound as they were by millenniums of conventions and prejudices, but this was not the twentieth century. It was the end of the twenty-second; to be exact, the early summer of 2189 A.D. Tastes change as the years pass, and if the Eyrie, as it was called, suited John Ballantyne, surely it would have been in the worst of taste for a millionaire of the twentieth century to criticise it, even had any such been there to do so—which there was not!

The Eyrie was rambling, extensive, and one story in height throughout, but that single story was far more spacious than anything a New Yorker of two hundred years previously had ever seen. The entire structure consisted of groups and colonnades of vast pillars, each joined to the adjacent ones by panels or walls, the whole being decorated with such consummate artistry that it conveyed an impression of delicacy and lightness, which contrasted surprisingly with the size and massiveness of the building.

An observer approaching the mansion would not have been justified in supposing the material of which it was constructed to be otherwise than what it appeared to be—stone—and would have marveled at the skill with which such an intractable material had been carved into the similitude of innumerable natural and artificial objects, each resplendent in its appropriate colors. Flowering vines twined around the great pillars; birds of many species ornamented the capitals and pilasters, and the walls were brilliant with geometrical designs, executed in every hue of the rainbow.

A closer examination by a twentieth century observer would, however, have revealed the surprising fact that if the building were of stone, it was some stone hitherto unknown to the mason. The surface varied in texture in accordance with the purpose for which it was used, the pillars possessing the polish of glass and the translucency of onyx, the vegetation being of a dull smoothness, and the feathers of the birds velvety and shimmering. Nowhere was to be found the coarse grittiness usually associated with building stone.

Stranger still, the walls were unbroken by either door or window. Having no visible means of entrance or source of light, one would have supposed the entire structure to be some immense mausoleum, some greater and more glorious Taj Mahal, but for the presence of several smaller buildings amongst the trees: garages for automobiles and hangars for planes. Indeed, with its apparent absence of light and air, the main building would seem to be little better than a very ornate prison.

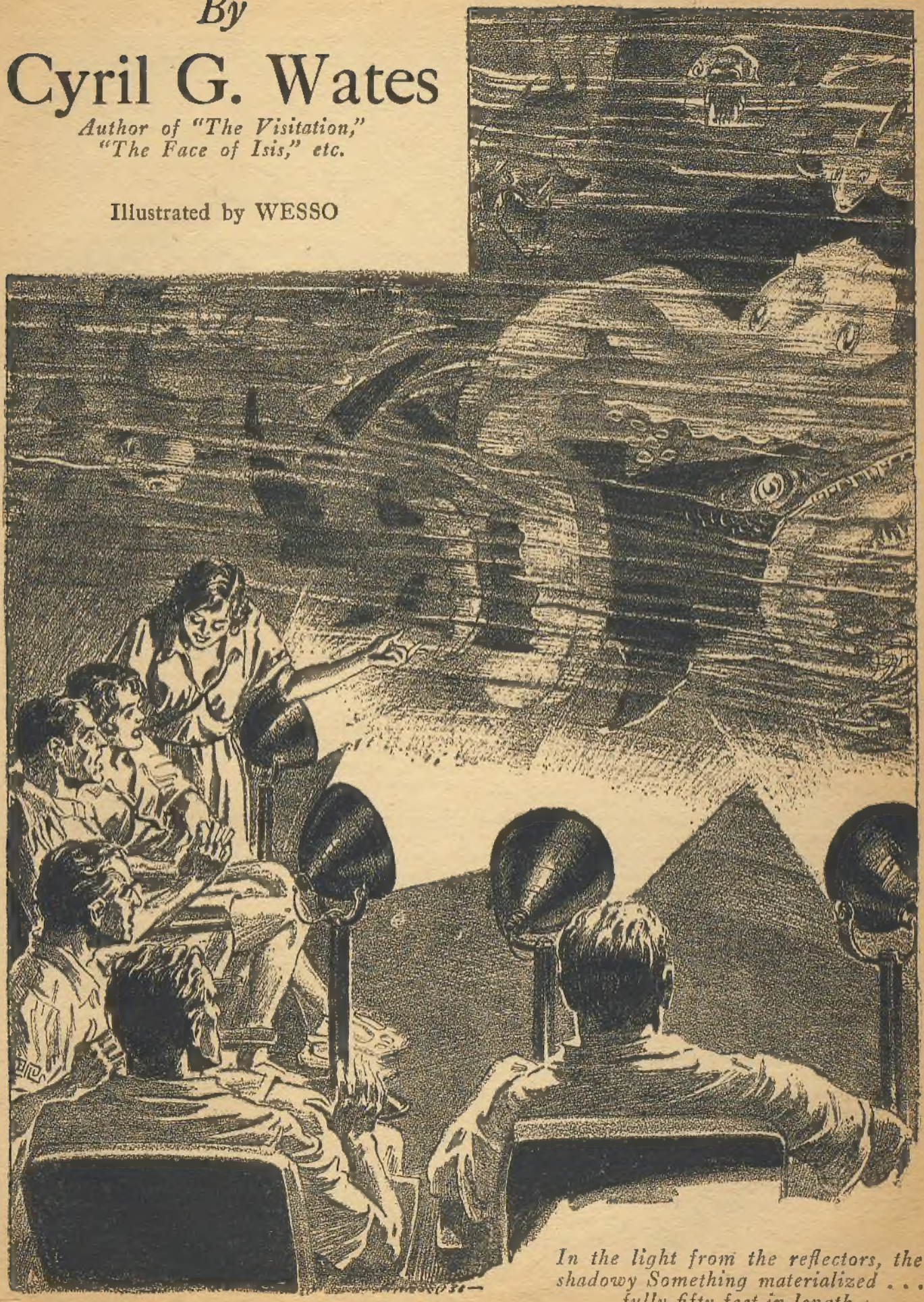
The gardens, which surrounded the mansion on three sides, were in the full splendor of their summer loveliness. Except for the winding pathways, it was hard to realize that the hand of man had ever been laid upon this riotous wilderness of bloom and verdure.

By

Cyril G. Wates

Author of "The Visitation," "The Face of Isis," etc.

Illustrated by WESSO



In the light from the reflectors, the shadowy Something materialized . . . fully fifty feet in length.

There was no attempt at segregating plants into beds or borders. There were none of the hideous monstrosities which were so much admired in the nineteenth century under the name of "lawns," torture fields in which the tender grass-plants, instead of being mercifully killed outright, as today when they are needed for food, were repeatedly beheaded in close proximity to the roots; a form of cruelty only to be explained by complete ignorance of the obvious fact that plants are living, feeling beings.

The sky was overcast and a soft rain was falling, veiling the distant hills in tenuous mist, through which could be seen the silvery shimmer of an approaching plane. With incredible swiftness it drew near until it was directly on a level with the Eyrie and then, after hovering for a moment, dropped like a plummet to the base of the cliffs. Just above where the plane had landed, a small promontory was occupied by a protruding wing of the main building, semicircular in form.

The interior of this wing was furnished with severe plainness. A large desk occupied the center of the straight side of the room, and seated at the desk was a man absorbed in study. He was in the prime of life, certainly not a day over eighty years of age, and his black hair was combed back and parted on both sides in the modern fashion, revealing a forehead unmarked by the passage of time, but at this moment contracted into a frown as he turned the pages of the report he was reading.

A soft light filtered through the walls and ceiling, flooding the room with pearly luminescence. Outside, the storm was passing away and the light in the room grew stronger as the wind dispersed the mist, but John Ballantyne remained buried in his papers until a sudden burst of sunshine poured over his desk like a golden flood and caused him to raise his head.

With a sigh, he pushed his papers to one side and, reaching behind him, pressed a button. Instantly the walls seemed to melt away, until they were far more transparent than the finest glass, upon which stood out the fairylike tracery of the exterior decorations. The sun was driving the rain before it down the valley and dozens of pleasure planes began to rise in all directions into the clear air.

JOHN BALLANTYNE placed a weight on his papers and touched another button. With startling suddenness, the transparent panels which formed the walls vanished into the interior of the pillars, leaving no trace of their presence. The whole room was converted into an open pavilion, through which the cool breezes blew unchecked. Ballantyne drew his purple tunic over his shoulders and walked across to where the floor ran out to the little promontory, terminating flush with the mighty cliffs of the Palisades. He stood for some minutes looking towards the west. Then he started back with an exclamation as his ankle was seized by a sinewy hand. Following the hand, appeared a curly brown head, a laughing face, and a pair of muscular shoulders, belonging to a young man who completed his perilous ascent of the cliff by turning a handspring into the middle of the room.

"Scared you that time, didn't I, Dad?"

"How many times have I asked you not to fool around on these cliffs, Raoul?" said his father, with some show of anger, "and how often have I told you not to call me by that prehistoric appellation?"

"About as often as I've asked you not to call me Raoul, I guess!" replied the young man, good-humoredly.

"That's different," replied his father. "Your sister calls you that and we've all got into the habit, I suppose. Personally I like it!"

"Yes, and personally, I like 'Dad'," laughed the boy, and then, seeing a shadow on the older man's face, he continued impetuously: "Sorry, John, but I didn't know you objected so strongly. I guess I like 'Dad' just because it's old-fashioned. I'll try to break myself of it."

"I don't know where you get your craze for old-fashioned things," said his father, not altogether mollified. "You can't seem to get it through your head that you're living in modern times, not in the days of George the Fifth and Coolidge, or whoever it was at the time of the Revolution!"

"Those old fellows back in the twentieth century were wise to a few things we don't know, John," said the boy, seriously. "They were as far ahead of us in science as we are ahead of them in commerce and art."

"I don't want to start an argument, Raoul," said his father. "Come and sit down. I've wished for some time to have a serious talk with you and the present will do as well as later."

Seated at his desk, John Ballantyne sat for some moments in silence, studying his only son with thoughtful eyes, in which there was not a little pride and admiration. Raoul was such a fine specimen of young manhood as he stood there. He had thrown back his crimson flexifer tunic, revealing the torso of a young Apollo. Golden sandals and crimson breeches completed the costume of a typical young man of the time. Physically he was a representative of the coming generation. What curious throwback was responsible for his strange, old-fashioned tastes?

Some such thoughts passed across the mind of the older man. He knew from bitter experience that his son had inherited from him an inflexible will which, in the past, he had attempted to bend to his own wishes many times without success. He felt that now, for the last time, he must present his arguments as persuasively as possible or forever give up the hopes which had centered themselves in his son for so many years. The bizarre notion that parents possessed some divine right to mould their children's lives into any pattern which pleased them was first questioned in the nineteenth century. In the twentieth it was discarded as a theory although often followed in practice, but in the last two hundred years, known to us as the Age of Social Enlightenment, it had been relegated to the limbo of forgotten things, together with such prehistoric fantasies as Unemployment and Mortgages.

Thus, when John Ballantyne addressed his son, it was as man to man. To have assumed an attitude of paternal authority would have been to yield to the same weakness for old-fashioned ideas which he had deprecated in his son.

"You are fond of me, Raoul?" he queried at last.

"Why, of course!" replied the young man, in surprise. "You know I think there's no one like you, John."

"Yes, I know that," nodded his father. "But what I can't comprehend is that in spite of your proven affection for your sister and myself, you still insist in frittering away your life in worthless pursuits."

Raoul was about to reply, but his father restrained him with uplifted hand.

"Let me have my say, Raoul. It's for the last time. I know what you were going to tell me, that ten or twelve hours a day in the laboratory is hardly frittering away time. In that I must differ from you. We read of people in past centuries who spent their time knitting in spite of the fact that such work could be done far better and more cheaply by machinery. As a casual amusement, persons of defective mentality might be excused for indulging in it, but as a life work, I think you will agree with me that knitting was, as I have said, frittering away one's life."

"Of course, but what has knitting to do with me, John?"

"Just this, Raoul, that like the chemistry and electricity of which you are so fond, it was a useless waste of time; well enough as a hobby but of no possible benefit to the world. Two hundred years ago or more men believed that there was no limit to the advancement of science, not realizing that, like explorers on an island, they had reached the ultimate shores of discovery. We know better today. We know that the limits of useful progress along scientific lines were reached centuries ago and that it is only to the field of social advancement that there are no boundaries."

"I will never believe that, John!" exclaimed Raoul, his face flushing. "Just because the study of science was practically abandoned in the face of the crying need for Social Advancement, is no proof that all the great scentific discoveries have been made. The world has always been like that. Progress has never been steady and continuous, but by leaps and bounds, with intervals of stagnation, like the flow of a mountain stream. It was only natural that after the Electrical Age, which culminated in the perfecting of Aviation and Television, the pendulum should swing in the other direction for a time and men should turn their thoughts inward. Art, psychology, the social sciences have been the chief study of mankind for two hundred years, but I will never admit that the fields of chemistry and electricity have been exhausted."

"This is barren discussion, Raoul," interposed his father, impatiently, "and will get us nowhere. If you feel the necessity of some hobby as an intellectual stimulus, I should be the last to object. The source of my unhappiness—for I will admit I am unhappy—lies in the fact that you, who have boundless opportunities for the advancement of your fellow men, refuse to accept your responsibilities. As my son, you fall heir to the greatest iron industries in the world today. The happiness of a billion human beings will be in your hands, their homes, their clothing, their transportation, even to some extent their food, comes from the Ballantyne iron mines. Yet you, with a century of useful life before you, persist in following that will-o'-the-wisp, Science!"

"I'm sorry, John. I wish, for your sake, that I could do as you ask, but I should be false to my convictions if I dropped my scientific investigations now. What old Polonius said nearly a thousand years ago is just as applicable today. 'To thine own self be true, and it shall follow, as the night the day, thou canst not then be false to any man.' I believe that science holds greater gifts to mankind than any she has revealed in past ages and I must obey my call."

"You must be off your head!" cried his father, angrily. "Insane—in a time when insanity is as obsolete as cancer and woolen clothes and—and science. Even in your sports you are an eccentric! Mountain climbing! I'll admit there are a few wild young men and women who think it a sign of extraordinary physical development to indulge in it, but when you carry it to the extreme of self-destruction, you are simply a suicidal maniac! Look at your face! In these times, when beauty of feature and perfection of physique are a universal ideal, you are a disgrace to our family. Do you wonder that your sister hesitates to bring her friends to the Eyrie when you are here!"

Raoul flushed deeply, the scars on his face standing out white against the crimson. He drew his tunic over his shoulders as though to hide the blush of anger which spread over his shoulders and chest.

"I'm sorry you feel that way, John," he said, quietly. "I'll not trouble you with my presence any longer. Perhaps some day I shall be able to convince you that I am right, and when that time comes, I'll come back. Goodbye, Dad," and he walked across the room and disappeared over the edge of the cliff.

For some time John Ballantyne sat motionless at his desk. His anger gradually ebbed, leaving nothing but the desire to retain his son at any price. After all, there was room for all kinds of people in the world and perhaps, if he removed his objections and gave Raoul a free hand to follow his bent, he would tire of his insane pursuit of science and take his rightful place as head of the great International Ferrous Products Organization.

The hum of a motor broke the silence and Raoul's plane leaped up past the Eyrie on its vertical ascent to the upper air lanes used by west-bound traffic. John Ballantyne reached across the desk and switched on the visophone. After a brief interval the figure of his son appeared on the screen in stereoscopic relief, his crimson tunic blown back by the wind coming through the open front of the plane. Raoul's brown eyes were turned towards his as the chime of the visophone on the dashboard of the plane drew his attention.

"Come back, my son!" exclaimed the father, his hand outstretched, as if he could grasp that of the image. Raoul's scarred face changed, his lips parting in a wistful smile, but he spoke no word. Then he shook his head slowly, regretfully. His hand reached out to the control-switch, and a moment later John Ballantyne was staring at the dark screen of the instrument. Jumping from his chair, he hurried to the western opening. The sun was touching the horizon, a disc of fiery splendor. A rapidly diminishing speck, silhouetted against that blinding glory, growing ever smaller to invisibility, was John Ballantyne's last glimpse of his son.

CHAPTER I

The Workshop in the Mountains

GEOFFREY VON ELMAR sighed with weariness as he straightened up from the bench over which he had been leaning for more than six hours. There is a limit to the strain which even the finest organization and the steadiest nerves can endure, and the long period of unremitting attention which was necessary for the delicate experiment in which he had been engaged, had strained both to the breaking point. Six hours of microscopic manipulation and the result—nil! The whole thing must be done all over again.

The room in which Von Elmar had been working was fitted out with elaborate equipment for carrying on scientific research work, but it would have been hard to say for what particular branch of science the equipment was designed. The laboratory was very large. At one end were benches and shelves containing stills, pipettes, test tubes, electric heaters, sand baths and all the thousand utensils necessary for the pursuit of chemistry. Adjacent to this were other benches bearing microscopes, polariscopes, tiny cutting instruments of all kinds—in fact everything that would be needed to carry on research work in organic chemistry, bacteriology and even surgery. It was here that Geoffrey Von Elmar had been working.

Along the wall was a row of cabinets containing innumerable geological specimens, but apart from this, the whole of the remaining space was filled with every conceivable kind of electric apparatus. It would be impossible to describe in detail, or even to catalogue, the enormous collection of devices, ranging from exploring coils and electron tubes, to gigantic transformers and ferroverters.

The room was warm and Von Elmar had been working without his tunic for comfort and freedom of motion. As he stretched his stiff muscles and yawned cavernously, he stood revealed as a tremendously powerful man with a development of chest and shoulders quite exceptional in an age that was noted for beauty and symmetry rather than for great strength. His face, which showed him to be in early manhood, would have been altogether likeable in its frankness and good nature but for the disfigurement of a jagged white line which traversed one cheek from the ear to the corner of the mouth; evidently the scar of some terrible injury.

Geoffrey picked up his tunic of somber brown and flung it over his shouders. Striding across the room to the only vacant wall, he pressed a switch. The panels slid apart noiselessly, revealing a scene of such wild magnificence that, familiar as it was to him, he could not suppress a slight drawing in of the breath.

He stepped out upon a narrow balcony with an iron railing and stood looking down into an airy gulf, above which he seemed to hang poised, like an eagle in full flight. A great valley, slashed through the heart of a mighty mountain range, the knife that had carved it still lying two thousand feet below, a glittering river of ice. Five miles away the peaks clustered together as though for companionship, lifting their hoary heads into the cloudless sky, their rugged gray shoulders forming a gigantic amphitheater, filled with a spotless field of eternal snow, from which blue icefalls cascaded downwards over crevasse and serac to feed the insatiable glacier.

The building of which the laboratory formed a part was constructed upon the face of a sheer cliff, which constituted one of the retaining walls of the glacier. The rear of the structure rested upon a natural ledge, but the greater part overhung the void, sustained by great steel girders whose lower ends fitted into diagonal notches cut in the rock a hundred feet below. There seemed no possible means of access to this aerial workshop except by plane, although a closer inspection would have revealed the presence of an elevator cage hanging by cables below the balcony.

The suave curves of the snowfields were beginning to flush with the rosy hues of sunset. Geoffrey turned his eyes towards the southeast. Presently his vigilance was rewarded by the sight of a small plane which came towards him at a great height. It cleared the summits of the opposite range, came swooping across the valley, hovered a moment on its sustaining helices and then dropped gracefully into the cradle provided for it at one end of the building.

A young man stepped out of the pilot's seat and waved to Von Elmar.

"Come and give me a hand with this stuff, Geoff!" he called as he started to unload sundry boxes from the rear compartment of the plane.

The newcomer resembled Geoffrey in stature and complexion but there the resemblance ceased. He was dark while Geoffrey was fair. He was graceful and agile, while Geoffrey was powerful and heavy. Instead of Geoffrey's knotted muscles, he possessed the smooth skin of the athlete and his regular features were without a blemish. In the old days, Ralph Morton and his friend Geoffrey Von Elmar might have posed for statues of Greek gods: Hermes and Vulcan.

As Geoff approached the plane, another man stepped out, a little man whose yellow skin and slant eyes bespoke Oriental birth.

This is Dr. Ota Umetaro,* Geoff. I met him in Denver and brought him along to help with the cell-growth experiments."

*Pr. O-tah OO-may-tah-ro. Ang. Plum Blossom.

Umetaro's handshake was accompanied by the slight bow and the restrained smile which in the Japanese gentleman combined friendliness, dignity and reticence.

"Your wish, Sir! I look forward with pleasure to working with scientists of such distinction," he said.

"Scarcely 'distinction,' Dr. Umetaro," said Ralph Morton, smiling, "since we are obliged to keep our small accomplishments to ourselves. If what we are trying to do became public, we should be more notorious than distinguished."

"Nevertheless, I crave your honored permission to adhere to my original word. The great world would indeed condemn your efforts in no uncertain terms, but there are a few here and there who secretly rebel against the dogma that our scientific knowledge is complete; that nothing must be either added to it or taken from it. To these rebels, scattered and yet united, among whom I am proud to number myself, you two gentlemen are, as I have said, distinguished."

Von Elmar was delighted with the courtly and yet frank manner of their new associate. Dr. Umetaro was a typical citizen of the Japanese Division, where, in spite of the almost universal intermarriage which had spread over the world in the last century, the old blood of the Samurai had been kept practically pure. He was built for speed and lightness, like a whippet, and his costume, although similar to that which was worn throughout the world, displayed the elaborate embroidery and brilliant colors beloved by all Orientals.

THE three men finished unloading the boxes of supplies, which Ralph had brought from Denver, and then moved along the balcony towards the laboratory. The doctor was enthusiastic over the unique location of this aerial workshop and the magnificence of the surrounding scenery. It was his first visit to the Canadian Rockies, and for once his admiration broke the bounds of his habitual reserve.

"To devote your lives to the advancement of science, that is courage!" he exclaimed. "But to choose a paradise like this for your work—ah! but that is genius! When every experiment fails; when every line of reasoning leads to a blank wall of discouragement; to be able to step out upon this balcony and draw new inspiration from the eternal peaks—what happiness! Gentlemen, you are to be congratulated!"

They entered the great laboratory and again the Japanese savant gave voice to unstinted praise for the completeness and ingenuity of the equipment. Ralph and Geoffrey took him on a tour of inspection, lingering here and there over some instrument or machine which displayed some novel feature which was the result of their investigations.

In the organic section, Dr. Umetaro again burst forth into delighted exclamations.

"Wonderful! Splendid! You have thought of and provided for every detail. Necleatromes, Chromosome-Separators— Ah! but what is this?" he asked, stopping in front of an elaborate machine which combined a pair of eyepieces, like a binocular microscope, with a complicated arrangement of coils, condensers and vacuum tubes.

"A little idea of Geoff's, Doctor," said Ralph. "We call it the Atomoscope. Tell him about it, Geoff."

"I'm afraid it hasn't lived up to its name so far, Dr. Umetaro. As you can guess, it's a kind of ultra-microscope for studying atomic structure. Instead of light, we use an extremely short-wave oscillatory current. The waves are reflected from the object being examined and then amplified, after passing through a scanning disc. The amplified current is then brought to this Glaucon Tube, the light from which passes through another synchronized scanning disc to the

eyepiece. It isn't perfect yet by any means. We haven't been able to see atoms, but we've got a magnification of several million diameters; plenty to study the internal structure of chromosomes, which was our real object."

The Japanese doctor was watching Geoffrey Von Elmar with kindly eyes as he talked, as much interested in the speaker as in his invention. The unassuming way in which the young expert divided the credit for his work with his companion and the light which diffused his ugly, scarred face were enough to convince the doctor that here was something more than a scientist: a loyal friend.

After supper, which was prepared by Geoffrey and served on the balcony, the two young men showed their new associate over the rest of the building—the storerooms filled with every conceivable kind of material for scientific research; the sleeping quarters on the roof; the transformer room where the power waves from the great station on the Athabasca River was picked up and converted to the voltage required for lighting the building and operating the machinery; and the elevator by which they could descend to the surface of the glacier for ski-ing and other exercise which was a part of the daily routine.

"Not that Ralph makes much use of the elevator," remarked Geoff. "He prefers his private stairway," and he pointed downwards to a series of natural cracks and ledges in the face of the sheer limestone cliff; a perilous ladder by which an active and fearless climber might make his way up or down.

Later, when they were seated on the balcony, with their pipes, watching a full moon turning the solemn peaks into a glistening fairy castle, Ralph asked the Doctor a question which had been in his mind ever since the Japanese had approached him in the rotunda of the Hotel Colorado, in Denver.

"How did you find out that Von Elmar and I were engaged in scientific work out here, Dr. Umetaro?" he asked. "We thought we had been successful in concealing our plans from everyone. We have posed as wealthy young mountain climbers who have a flair for solitude. Yet, from hints you have dropped at various times today, it would seem that our object in isolating ourselves in the mountains is public property. And then, who are these 'rebels' of whom you speak? Surely no political organization is planning a revolution such as we read about in old books?"

The Doctor puffed at his pipe thoughtfully.

"Have you young gentlemen specialized in history, by any chance?" he asked presently.

"I can tell you the date of the International Amalgamation," said Ralph, laughing. "That's my limit."

"Read a book called 'Hereward the Wake' a long time ago," said Geoff. "All about a fellow named Harold. One of the early presidents, I think. Had his eye punched out."

"Then it is certainly time that your education along those lines was improved. In order to answer the questions you have asked, Mr. Morton, I must tell you something of what has been taking place in the world during the last three hundred years. Have you the patience to listen to a lecture on ancient history? I think I can promise to make it interesting."

CHAPTER II

The World in 1950

"THREE hundred years ago," said Dr. Umetaro, "the reading public were greatly interested in books dealing with the future development of the world. To meet this demand, a tremendous amount of literature was produced, some commonplace, some imaginative, much of it far-fetched and sensational in the extreme. But no matter how unreal and impossible a book might be, if it dealt with the 'days to come,' the author was sure of a favorable reception.

"Amid this mass of reading matter, there were two books which enjoyed a popularity probably in excess of any other. At least, one would judge that this was the case from the immense number of copies which were sold. The first of these was written about 1890 by Edward Bellamy, whose fame as an author rests almost entirely upon this one book. It was entitled 'Looking Backward' and it predicts the future of the world in the year 2000. The second book to which I refer appeared about thirty years later. It was called 'When the Sleeper Wakes' and was written by H. G. Wells, a prolific author of novels and imaginative romances in the English Division.

"These two books resemble each other in the use of a similar device for producing an effect of realism in the mind of the reader, namely, a sleeper who awakes in a new world after a prolonged period of unconsciousness and describes what he sees, contrasting it with the conditions he left behind when he fell asleep."

"Excuse me, Doctor," interrupted Geoffrey. "You say this Bellamy wrote his book about 1890 and that he described conditions in 2000? That's a hundred and ten years. I don't quite understand why he would need to introduce a 'sleeper' in his book. A young man—say twenty——"

"You're forgetting we've doubled the average life span since then, Geoff," said Ralph. "Seventy was old age in the nineteenth century, wasn't it, Doctor?"

"Of course, I should have known that!" ejaculated Geoff. "Go on, Dr. Umetaro. I won't interrupt again."

"Please do not hesitate to do so," said the Japanese, smiling. "I am very desirous that you should understand the meaning of conditions as we find them today, because I foresee that you gentlemen are to play a prominent part in world events in the near future."

"Why, Doctor! What makes you say that?" exclaimed Ralph.

"The answer lies hid in your own hearts," answered the Japanese, with a little upward gesture. "Well, to continue. I have spoken of these two pseudo-prophetic books with their sleepers. It is safe to say that thousands of people in those far-off times really thought such books foretold the progress of the world with a fair degree of accuracy, and yet, if Bellamy and Wells could have taken the place of their principal characters and awakened in the year 2000, I am certain they would have received the shock of their lives, not because of the tremendous changes with which they would find themselves surrounded, but rather because a casual inspection or even a careful examination would fail to show that the world today is any different from what it was in 1900. Not that it *is* the same—we know how deep-rooted the changes are—but simply that the transformation does not appear on the surface.

"Bellamy, the earlier writer, would be most impressed with the visible signs of progress, but it would be a sad shock to his powers of prophecy to find that the material and scientific advance which he predicted for the year 2000 had been reached and far surpassed, before a third of that time had elapsed. Wells, however, would most certainly be sadly disappointed to find people still doing their traveling in trains, airplanes and motor cars, little if any difference from those to which he was accustomed during his lifetime. But I'm getting ahead of my story.

"What I have said will perhaps convey the correct impression that people in those times were convinced that they were on the verge of a great transformation;

that Utopia was about to arrive, all complete to the smallest detail and done up in a neat package with a ribbon around it, without any special effort on their part. Early in the twentieth century occurred one of those ghastly upheavals which form so large a part of the history of the old world. It was known as 'The War to End Wars' and although millions of men, yes, and women too, gave their lives for a cause which, to say the best, was less unjust than most, the survivors soon found that so far from ending wars, this great shambles had served only to whet the appetite of the war-makers.

"Although for many years after, no great war took place, the facts go to show that the governments of the world, of which there was an infinite variety, were simply waiting for a new generation to arise to supply what was described with gruesome humor as 'cannon fodder.' While the ranks of the people were pacified with great peace demonstrations and disarmament treaties, the energies of most governments were being concentrated on devising new and more horrible methods of warfare."

IT was Ralph who interrupted this time.

"But I don't understand, Doctor," he said, wrinkling his brows. "You speak of 'the ranks of the people' who seemed to desire peace, and 'the governments' which were set on war. Surely most of the countries in those days were more or less democratic. That would mean that there was no essential difference between the 'governments' and the 'people.'"

"You are right, Mr. Morton," said the Japanese. "Just as there is no essential difference between a man breathing mountain air and a man breathing pure oxygen, but we know that in the latter case, the most phlegmatic man becomes a veritable demon of energy. As soon as a man was removed from the 'ranks of the people' and became a member of the government, he found himself enclosed in an atmosphere of distrust and pugnacity. Governments rarely, if ever, deliberately planned war. It was an essential part of an artificial system. It was one of the rules of the game that the only way of atoning for a so-called slur on national honor, was by slaughtering as many of your fellow-men as possible. It would have been cowardly murder to stab your neighbor in the back because he claimed that your fence was a foot on his property, but it was an act of the highest courage to shoot a thousand fellow-men from ambush, because their government claimed that the international boundary line was in the wrong place. And the curious thing is that no one seemed to realize the fallacy of this line of reasoning!"

"What a horrible business it must have been!" exclaimed Geoffrey. "How could men go out for the deliberate purpose of killing each other—practically in cold blood, too?"

"It's not the actual killing that turns my stomach," said his friend. "After all, a man can die only once. It's the state of mind which made such killing and maiming right or even possible that seems so ghastly!"

Dr. Umetaro nodded.

"You're right, Mr. Morton. You have laid your finger on the root of the matter. People in those days didn't really believe that war did any good. War was a habit with them; a habit whose antiquity made it the more difficult to shake off. As they would have expressed it, Mankind had a war 'complex'. But let us be just. War has two good marks to its credit. It produced a type of self-sacrifice and courage unexcelled and perhaps unequalled today, and it contributed enormously to the advancement of science."

"Oh! come, Doctor!" exclaimed Ralph. "That's going a bit far. I can well believe your first statement, but that war, the very essence of destruction, could advance science, the epitome of progress, is pretty hard to swallow!"

"Nevertheless, it is the naked truth. You must remember that the war-makers of the Nations were keenly alert to acquire any new device which would help either directly or indirectly in butchering their enemies. With unlimited funds at their command, these Governments were able to offer powerful incentives to inventors and scientists. As a single example, you know that the problem of flight was solved by the famous Wright brothers early in the twentieth century, but perhaps you are not aware that little progress was made in aviation until the 'War to End Wars' broke out. More actual advance was made in the art and science of flight during the four years of that contest, than in the quarter-centuries preceding it.

"As I have said, this great war was followed by a period of what in those times passed for peace, a period of nearly fifty years unmarked by any but minor disturbances, hardly worthy of the name of wars. This half-century brought forth three great discoveries —television, the wireless transmission of power, and, last and greatest of all, the transmutation of iron. You have only to read the books of the period to realize the tremendous influence which these three inventions had in transforming the face of the earth. The perfecting of television with all its ramifications, was the last link in the chain which was to bind the world into one great union of friendly communities. The wireless transmission of power solved the last difficulty in the way of universal conquest of the air. As to the transmutation of iron, that epoch-making discovery was so totally unexpected and so immediate in its effects that we, today, can hardly conceive the magnitude of the changes that it wrought.

"Early in the year 1952, a student in the University of Chicago was engaged in preparing his graduation thesis. He had chosen for his subject 'Allotropism in Carbon and Sulphur.' It had long been known that these two elements appeared in several utterly dissimilar forms. Nothing can be more unlike than the diamond, graphite, and charcoal, yet all three are pure carbon. Sulphur also appears in two or more forms. Little or nothing was known to account for these strange phenomena and scientists contented themselves with vague statements about molecular arrangements, little suspecting that in allotropism lay hidden a power which was to transform the face of the earth.

"This young student's name was Walter Ballantyne. He was the ancestor of John Ballantyne, who controls the iron industries of the world today. One day while working in the laboratory with a sample of charcoal, he happened to place the porcelain dish containing it near the terminals of a very powerful transformer connected with the wireless power aerial. When he returned from an adjacent room, where he had gone to fetch a microscope, he found in place of the pinch of black powder he had left, a hard, semi-transparent lump. In a word, the charcoal had been converted into diamond by the inductive action of the current.

"Ballantyne's excitement can be imagined. He repeated the experiment more than once and did not rest until he had established the exact conditions under which the transformation took place. In those days the diamond was extremely valuable and most young men having by accident tapped a mine of inexhaustible wealth, would have dropped science then and there, to take up a life of idleness and luxury. Not so Walter Ballantyne. Feeling that he was on the verge of some basic discovery, he flung himself into his work with renewed energy. Success followed success. Soon he was able to produce all the allotropic forms of carbon and

sulphur at will, besides several hitherto unknown, such as fibrilite, a form of carbon capable of being drawn into threads as fine as silk and possessing over one hundred times the tensile strength of steel wire.

"It was the discovery of fibrilite that made Ballantyne turn his attention to other elements in the hope of producing new forms of allotropism. With the exception of a few minor and valueless changes in cobalt and nickel he got no results until he tried iron. If he had been astonished at the transformation of charcoal into diamond, what must have been his feelings when he found iron filings converted into a colorless liquid and again into a fabric as soft as velvet and crimson in hue.

"Experiment after experiment was successful beyond his wildest dreams. Whether it was the unique magnetic properties of iron which rendered it peculiarly susceptible to change we know no more today than Walter Ballantyne did two hundred years ago, but the fact remained that this element seemed as flexible as clay to the magic process of allotropism. One is reminded of the old chemists who took a pot of tar and produced from it all the infinite hues of the rainbow in aniline dyes.

"Ballantyne built a special group of transformers, the parent of the gigantic ferroverters of today, and began to experiment in earnest. He found that by suitable combinations of power he was able to reproduce in iron all the qualities which had heretofore been regarded as strictly inherent in other substances. Hardness, malleability, tensile strength, weight, color, transparency, even taste and odor, could be imparted to iron separately or in any combination, in the infinite diversity of its allotropic forms. In short, there was no substance known to mankind which could not be replaced to advantage by some transmuted form of this master element, iron.

"When he had definitely determined the broad basic principle governing the various transformations, then, and not until then, Walter Ballantyne turned his attention to the practical side of his great discovery. He had kept his investigations entirely secret, and when they were concluded he seems to have dropped them completely and devoted much thought to the best way of giving the results to the world. He did nothing in haste, but when he finally acted, he displayed the keen business acumen which has been the outstanding characteristic of the family ever since.

"ONE day in early summer, a dark-haired young man of quiet, studious demeanor presented himself at the New York office of the Pan-American Steel and Iron Company and asked for the president. He was, of course, refused admittance—great financiers in those days had a quite extraordinary idea of their own importance and cherished a notion that they added to their dignity by making themselves inaccessible. The quiet young man was not at all discouraged. He took out his notebook and scribbled a brief message which he handed to the secretary with the request that it be carried to the great man.

"That scribbled note reposes in a glass case in the Museum at Chicago—one of the most prized treasures of the world. It read as follows:

"'I can double your net income in twelve months. And I don't mean maybe!

Walter Ballantyne.'

"Perhaps I should explain that the second phrase in this note was a favorite expression of those times conveying definite assurance of some doubtful statement.

"Ballantyne's eccentric message gained him admission to the presence and his quiet air of self-command gained him a hearing. It is a wonder that his proposal did not gain him a violent ejection!

"Briefly summarized, his ultimatum was this. He had made a discovery which he believed would greatly increase the demand for iron. He would place this discovery at the exclusive disposal of the Pan-American Company for five years, at the end of which time, it was to become the property of the world. If, as the result of his discovery, the net income of the company was quadrupled in two years or less, he was to receive a half interest in the company!

"Can you picture it? I like to think of that studious young man with his quiet manner and his unbounded self-assurance demanding, at one bound, to be made the richest man in the world! And I like to imagine the emotions of those hard-headed business men, contempt merging into amusement, amusement into doubt, hesitation, anger and dismay, until at last they yielded and signed their names to the cast-iron contract which Ballantyne had prepared, with a touch of characteristic satire, on a sheet of white ferrotiss, the allotropic iron equivalent of paper.

"That Ballantyne more than fulfilled his part of the agreement is common knowledge. In six months gigantic ferroverters were turning out hundreds of allotropic forms of iron in tremendous quantities. There was hardly any substance in commerce which could not be replaced more cheaply by some form of iron. Newspapers and magazines could be printed of ferrotiss at a fraction the cost of paper. Ferrolith took the place of wood and stone for buildings and had the advantage that it could be made opaque or transparent, a conductor or a non-conductor of heat at will. Flexifer was greatly preferable to cotton, silk or wool which it resembled, and rapidly replaced these materials for clothing and draperies. It was equally beautiful, much more durable, warmer or cooler as desired and had the added advantage that it could be sterilized at any time by simply heating it red hot without damaging it in the slightest.

"It might be supposed that the sudden replacement of so many of the natural products by cheaper and better forms of allotropic iron would have resulted in a disruption of the national organization amounting to anarchy, but such was not the case. As fast as men were thrown out of employment in other trades, they were absorbed by the ever-growing iron industry and its offshoots. But there was one thing Ballantyne had overlooked in his famous contract. If he imagined that the other nations were going to sit dormant for five years while the United States captured the commerce of the world, he was vastly mistaken. In the winter of 1954 a Brazilian workman stole the carefully guarded secret of the Ferroverter and sold it to his government.

"This was the opportunity for which the military faction had been waiting. On December 25th, the United States declared war on Brazil."

CHAPTER III

The World in 2200 A. D.

THE Japanese professor stood up and stretched his slim, wiry body.

"I am sure that you gentlemen must be very weary, listening with such commendable patience to a dissertation so long drawn out."

Both young men protested vigorously.

"Don't stop now, Doctor!" begged Ralph. "It's early yet, and surely you don't intend to leave us in mid-air with our curiosity unsatisfied."

Geoffrey added his persuasions.

"Of course, I know a little of what you have been telling us, but only a very little. I always hated to take the time from my science to devote to history. What you have said serves to link up a lot of disconnected ideas. Please go on, won't you?"

"Upon your heads be it!" acquiesced the Japanese doctor, with his fleeting smile, as he settled back in his chair. "Where was I—Oh! Yes. The declaration of war on Brazil.

"That declaration came as a thunderbolt to the great mass of the population. Interest in politics had waned more and more until, at the time of which I speak, elections were hardly more than a formality. There were sharply defined cliques, not only in the United States but in all other civilized countries, as well, which made a business of conducting the governments. These cliques, as I have told you, thought in terms of war, but the average man and woman had grown so thoroughly accustomed to peace that it was looked upon as a permanent condition. In fact, there is every evidence that the large majority believed the declaration of war to be a pre-arranged diplomatic pretense to arouse interest in some military display, such as a sham air battle.

"They were soon to be disillusioned. Less than twenty-four hours after war was declared, Chili, Argentine, and South Africa had joined forces with Brazil, while Canada with its huge population, and England, still head of the British Empire, though with a population of less than twenty million, had offered to support the United States.

"The war would, of course, be fought largely in the air. There were no large standing armies in any of the belligerent countries—the experience of the last war had shown that a nation's strength lay in its volunteers—but practically everyone could handle a plane even in those days. The Government began to discuss finances and in the meantime sent out a stirring call for a million volunteer pilots and observers to handle bombing planes."

Dr. Umetaro paused for several seconds and then went on abruptly.

"I despair of being able to convey to you the reasons which were responsible for the astounding outcome of that call to arms. I can only repeat that there had been nearly forty years of peace and that people had lost all interest in professional politics. What curious transformation had developed in the mass consciousness during those decades of peace, it is hard to say. I can only tell you the facts.

"One week after the call for volunteers in the United States, with a population of two hundred million, *only six men and two women had come forward!* Of these, five were found to be mentally defective!"

"I'm surprised that there were that many," said Ralph, shrugging his shoulders.

"That is how I should expect the situation to strike you, but remember that in those days, people looked at matters differently. In the 'War to End Wars' men and women volunteered by hundreds of thousands. It was regarded as the only possible thing to do in order to retain one's self-respect. At the declaration of war against Germany, England and France were swept by a wave of passionate patriotism.

"But in 1954 when the United States called for volunteers for a war against Brazil, the country was swept by a gust of amazement, followed by a cyclone of laughter. They looked upon the florid, patriotic posters, which were televised to all parts of the country, as a huge practical joke. Not that the citizens were not patriotic. They were, very much so, but how would you two gentlemen regard a politely worded invitation to join a select party for the purpose of jumping over this balcony to the glacier? That was the attitude the people took towards the war against Brazil!

"The Government was frantic. Every possible method was used in an effort to arouse the populace to a proper sense of their duty as soldiers, but it simply would not do, and at last the Government resigned in a body, swept out of existence by a gale of merriment.

"In the meantime, the other belligerents were passing through similar experiences, modified by circumstances and racial characteristics. In Ottawa, the Canadians resorted to tar and feathers to express their feelings towards the members of the cabinet. The Brazilians, who are a hot-headed race, blew up the President's house, fortunately at a time when His Excellency was at a conference. The servants having been warned, no harm was done. The English, running true to form, courteously ignored a war to which they had not been introduced, and simply froze out the Parliament which had attempted to perform the introduction.

"It would take far too long for me to trace the results of that ridiculous declaration of war in all the countries involved, neither would it serve any good purpose. It suffices to say that many countries, including the United States, were temporarily without governments, while others, like England, retained the form of government simply because the people ignored the statesmen. For a little while it appeared as though the whole world was on the verge of anarchy.

"It was then that Walter Ballantyne showed his true greatness. One evening, without taking anyone into his confidence, he stepped into his private plane and at noon the following day he entered the palatial residence of Senor José Pascano, managing director of the great Brazilian Corporation, whose employee had stolen the secret of transmuted iron. What took place at that conference we do not know, but we do know that two days later Ballantyne and Pascano presented their cards at Buckingham Palace and were immediately admitted to the royal presence of King George the Sixth. This ruler, who had a full share of the enlightenment and sound common sense which had marked his uncle, Albert I, and his grandfather, George V, was more than willing to listen to the suggestions advanced by the American Scientist and heartily supported by the Brazilian financier.

"Just a week later—the exact date was, as you are aware, Mr. Morton, February 14th—a proclamation was broadcast and televised to all parts of the world from the Island of Santa Lucia, stating that a Federation of the World had been established with headquarters at that point under the temporary supervision of Walter Ballantyne, George Windsor and José Pascano, who were ready and willing to accept applications for membership in the said Federation. An open invitation was extended to anyone who so desired to come to Santa Lucia and help the intrepid three in their self-assumed task of creating a new heaven and a new earth.

"There were no suggestions of elected delegates or Ministers-Plenipotentiary. There was no restriction as to who might or might not join this self-constituted Board of Governors, save only that no person who had held any sort of office in the defunct governments might apply. There was not even any idea that nations should take a vote on the subject.

"THE attitude of the three was simple in the extreme. They said, in effect, 'We've started a government. We're going to do our level best to make it a good government. If you like it, come and help us make it a still better government. If you don't like it, tell us why, and we'll try to change it to suit you. Only it *must* be the same government for everyone.'

"Mind you, gentlemen, the idea was not original with

Ballantyne. Wells, the writer of whom I spoke, had suggested the plan fifty years earlier, but these three were the first to put it into effect. You might suppose Santa Lucia would be flooded with cranks of all sorts, boiling with enthusiasm at the prospect of being able to start their own pet hobby horses down the track, but such was not the case. The people of the world were willing enough to accept any government which would get them out of the mess in which the old politicians had involved them, but they were quite willing to sit back and see what the new World Federation had to offer. In the end, the three were forced to invite individuals to join the Board of Control, as they called themselves. They tried to get men of all nationalities, because they wanted to understand the various racial viewpoints. Aside from this, as Ballantyne pointed out, the sole qualifications were a keen sense of logic and an unbiased mind.

"Really, my friends, you would be surprised to find how utterly biased and unreasonable the average man or woman of the twentieth century was! People were willing to believe anything, no matter how ridiculous. The attitude of ninety-nine per cent of the population in those days towards anything they did not understand may be summed up in the popular phrase, 'There may be something in it!' People were simply too lazy to think or even to learn.

"The first thing to which the Board of Control turned its attention was the vital matter of employment. It seems inconceivable to us today, but from the earliest times of which we have any record until the formation of the World Federation, from five to twenty-five per cent of the working population were always idle and without means of support. It is one of the signs of the illogical reasoning prevalent in those times, that everyone regarded unemployment as a necessary evil, instead of a ludicrous anachronism.

"If you put one man on an uninhabited island there would be no unemployment problem. Robinson Crusoe had no cause to complain that he could not find work—rather the reverse! But put a million men in a country filled with all the necessities of life and it was entirely reasonable that they should starve and shiver in idleness. That was twentieth century logic!

"The 'Three,' as the original members of the Board of Control came to be known, entered on their tremendous task of remolding the earth 'closer to the hearts' desire,' rather poorly equipped save for unquenchable enthusiasm and a firm belief in the essential sanity of human nature. In their comparative ignorance, they probably thought that their work would be finished in five years, at the outside.

"When the Board entered into this question of unemployment and began to realize how the whole matter was woven and interwoven with the infinite ramifications of such apparently unrelated subjects as Finance, Banking, Transportation, Standards of Living, Inheritances and even Climate, the 'Three' must have felt like little boys who had closed the starting switches on an Atlantic Air Liner and then found that they could not handle the controls! If they were discouraged, they showed no sign of the fact, but simply buckled down to work with the determination that they would do a little at a time and do that little so well that it would not need to be changed or tampered with.

"It was George Windsor, erstwhile King of England, who first formulated the principle of Employment which has governed the world ever since. His words have become axiomatic throughout the length and breadth of the World Federation. There had been much argument in the Board Meetings as to the best way in which to distribute the resources of the earth. Some one brought up the suggestion of that same Bellamy of whom I spoke. Bellamy's theory was that every man and woman, from the cradle to the grave, should receive an annual income equal to the total world income divided by the total population.

"'That's ridiculous!' exclaimed George Windsor (I quote from the official reports of the Conference). 'You might as well pass a law that any person attending a public restaurant shall be obliged to eat a small portion of every dish on the menu, whether he likes it or not.'

"'The cases are hardly parallel, sir,' protested Vestrinoff, who had made the suggestion. 'I am not proposing to dole out the actual products themselves, but the value of them. Each person could spend his income as he or she wished.'

"'I understand that perfectly well, Vestrinoff,' said the young Englishman, 'but the principle is the same. Take ourselves as an example. You are passionately fond of mountaineering. You would regard a day in the mountains as wasted unless it brought you through infinite toil and danger to the summit of some great peak. Now I love to wander on the valley slopes and caress the wild flowers or drink in the changing aspects of the scenery. Would you consider it just or reasonable that I should be forced to follow in your footsteps regardless of my own inclinations?'

"'I think I see your point,' said the Russian, thoughtfully. 'You think that personal ambition and accomplishment should be a factor in determining individual income?'

"'Well—yes,' said Windsor, hesitatingly.

"'Gentlemen,' interposed Pascano, 'if this Board differs from other bodies of idealists which have tried and failed in the past, it is in that we are planning a world which shall get the best out of human nature as it is, not trying to change human nature to make it fit an impossible Utopia. All men are not alike. Some desire wealth and luxury, while others are happy with the bare necessities of life, so long as they can have peace and leisure to cultivate knowledge or friendship. Whatever plan we adopt, justice must be blended with practical expediency.'

"George Windsor had been scribbling on a slip of paper while the Brazilian financier had been speaking. Now he stood up and read quietly:

"'*Healthy and congenial occupation with an adequate income for all. Equal opportunities to all and to each the full reward of his accomplishment. Unfair privileges at the expense of others, to none.*'

"These words, coming strangely from the lips of the young man who had sat on the throne of the greatest empire the world has ever known, were the foundation stones of our social structure today. The speaker and all his companions, gathered there under the Santa Lucian palm trees, had long been in their graves before the building was complete, but the threefold cornerstone which George Windsor laid has remained inviolate to this day.

"'The Law of the Triangle,' as it came to be known, was the first pronouncement which emanated from the Board of Control. It was met with a burst of enthusiasm from the waiting nations of the world. The workers welcomed it as a new revelation. The wealthy who had accumulated riches by their own knowledge and efforts, breathed a sigh of relief that their incomes were not to be ruthlessly slashed to the bone by a heartless band of idealists. Only those who were reveling in luxury on the proceeds of inherited fortunes or as the result of political patronage shook in their shoes or girded their loins to fight the new Federation, but they were helpless. One after another the Nations pledged themselves to obey the Law of the Triangle. The last to enter was the little Republic of Switzer-

land, which held off because here, alone in all the world, men did not feel the need of any change.

"IT was the inspiration of a moment to formulate the 'Law of the Triangle,' but it was the work of a century to bring it to full fruition. In every land men lost interest in the Physical Sciences and turned their attention to the science of the Social Structure. Just as in the early years of the century, boys had flocked to the universities to study electricity and chemistry, so now they crowded the institutions of learning to delve into the mysteries of finance, psychology, transportation, production and law. In 1927 there was a popular feeling that the scientists should take a ten-year holiday to allow the world to catch up. In 1960 such a holiday actually began, to last, not for ten years, but for over two hundred!

"One of the earliest acts of the Board of Control was to issue an appeal that nothing should be done hastily or without careful consideration. No man was to be allowed to suffer as the result of the new régime. Changes were to be gradual and spread over many years, so that the coming generation might grow up naturally under the Law of the Triangle, while the passing generation would hardly realize the transformation.

"Today we live in a world which is so utterly different to what the idealists of the nineteenth century predicted, that I was justified in saying that Wells and Bellamy would be dumbfounded if they could awake in it. We still have our millionaires; men and women who, by unbounded ambition and hard work, have earned the financial reward to which they are justly entitled, but we have no one living in idleness on the interest of accumulated money. We still have an innumerable company who would have been called poor in the old days, but who are no longer regarded as such because they have everything in life that they desire. There is no such thing today as a national 'Standard of Living,' because each man moulds his life to suit his tastes. John Ballantyne lives in his huge palace on the Hudson and no one envies him his wealth, for he has earned it. David Windsor, descendant of an English King, works two months in the year in the Ballantyne factory in London, in order that he may spend the other ten months in his Devonshire cottage with the ancient Greek philosophers who are his friends. He is jealous of no one, for he has what he desires.

* * *

"BUT I'm wandering far from the line which I had intended to pursue. You will easily understand that the intense fascination of sharing in the creation of this Age of Social Enlightenment weaned our men and women from the study of the physical sciences. Little by little the spirit of research which had inspired the great scientists of the earlier centuries faded and died. Even as early as 1930 signs were not lacking that some branches of science were regarded as complete; that nothing more could be accomplished. For example, little or no vital progress was made in transportation for nearly sixty years after the invention of the airplane and the automobile.

"As the years went on, people came to regard the mass of scientific knowledge as unalterable. The occasional enthusiast who wished to branch out into new lines of scientific research was looked at askance, much as a social revolutionist or religious free-thinker was regarded in earlier times. During the last fifty years this prejudice has reached such an extreme that it is a brave man who would venture to suggest that we have anything to learn about the universe in which we live.

"There have been rebels against the existing order of things in all ages, and the present is no exception. Here and there, men and women imbued with the hunger for knowledge which is undying in the human race, have secretly sought to delve still further into the mysteries of Nature. Like calls to like, and a world-wide organization has grown up, under a pledge of the deepest secrecy, numbering in its membership practically all those who refuse to accept the ultimatum of the Board of Control forbidding scientific research. This organization, of which I am Japanese Vice-President, is known to its members as 'The Rebels.' We have means by which we discover possible recruits to our ranks, and it was due to information which I had received from certain sources that I was led to accost you in Denver, Mr. Morton.

"Year by year 'The Rebels' grow stronger. The time draws ever nearer when, we hope, by some great scientific revelation which shall benefit the whole world, to induce the Board of Control to remove the ban which now rests upon Science. When that time comes and the world enters upon a new era of progress, it is my hope that you two gentlemen, Ralph Morton and Geoffrey Von Elmer, may have your just share in the great event."

Earth's silver satellite had passed the zenith and was beginning to drop down towards the western mountains. The glacier seemed to shine with an unearthly radiance of its own. Wisps of gossamer clung around the higher summits and crept sinuously through the passes. An avalanche dashed down some hidden couloir with the rumble of distant drums and the clash of faint cymbals.

For a long time the three men sat in silence, absorbed in their own thoughts and the unutterable beauty of the scene. When the soft accents of Ota Umetaro's voice had ceased, neither Ralph nor Geoffrey had made any comment on the strange story which the Japanese scientist had told them. There was an unspoken understanding between these three. Each saw with the eye of faith a world freed from the narrow bounds of bigotry and prejudice, ready to pursue once more its way to grander heights and more noble conquests. It was nothing new. In every age the hands of the many have fettered the feet of the few. In the twentieth century it was the social reformers who were tied down by the mental inertia of the mob. Now the pendulum had swung to the other extreme and scientific progress was hopelessly impeded as it had been in the days of Galileo, by that hatred of change, which alone holds mankind back from becoming fully divine.

Presently the mellow chiming of a deep-toned bell broke in upon their thoughts.

"An extra issue of the New York Tele-Post," Ralph explained, rising. "We subscribe to that and the Paris Tele-Semaine, in order to keep in touch with the outside world."

Geoffrey and the Doctor rose also.

"I should like to see your Telegon, Mr. Morton," said the latter. "I understand that they are slightly different from the Japanese model, which was the invention of Tsuki Konoma, and was authorized for use in the Japanese Division in 2024. Of course, there has been no change in it since then!" he added, rather bitterly.

They entered the study, a small room adjacent to the laboratory. Geoffrey pressed a button and the Ferrolith walls glowed with a pearly radiance which lighted the room without shadows. There were two desks. One wall was lined with bookshelves. Between the desks stood the usual Visophone with its transmitter, receiver, calling dial and opal glass viewing screen. Beside it was a large cabinet of polished Ferroak, one

of the numerous transmuted iron substitutes for wood.

Ralph opened the front of the cabinet and revealed a mass of complicated machinery.

"You said something about the Paris Tele-Semaine," said the Doctor. "What is that? It is new to me."

"The company was started in France last year," said Geoffrey. "They transmit a complete book once a week, sometimes a novel and sometimes non-fiction. Here is a sample volume."

He took a book from one of the shelves and handed it to the Doctor. It was beautifully printed on heavy ferrotiss and bore the title, "The Influence of Friendship on Mass Production, by Shani Singh."

"But we are forgetting the Tele-Post Special," exclaimed Dr. Umetaro, laying down the book and picking up the single sheet of ferrotiss which lay in the basket. He glanced at the headlines and snapped out an exclamation in Japanese. There was something in this printed sheet which had broken down his customary Oriental immobility. He passed the paper to Ralph.

"Gentlemen!" he said, in a low, strained voice, "our great opportunity has come even sooner than we expected."

Staring out from the white surface of the ferrotiss in large letters they read these words:

BRAZILIAN IRON ORE DEPOSITS UNEXPECTEDLY EXHAUSTED
JOHN BALLANTYNE CALLS INTERNATIONAL CONFERENCE TO AVERT COMMERCIAL CATASTROPHE
BOARD OF CONTROL SERIOUSLY ALARMED

CHAPTER IV

A World Crisis

JOHN BALLANTYNE was awakened from uneasy slumber by the deep chime of the Visophone bell at his bedside. He reached over to switch on the viewing screen and put the earpiece of the combination telephone to his ear. Simultaneously, the features of a dark-skinned young man appeared upon the screen.

"What is it, Kana?" Ballantyne queried, sleepily.

"You asked me to call you at 7:30, sir," replied the other. "You said you had an important meeting in the New York office this morning."

Ballantyne sat up fully awake. Of course! How could he have forgotten? This was the day of the Inter-Divisional conference which he had called to discuss the appalling situation at the mines. He had lain awake half the night worrying about it and had at last been forced to call for Kana to put him to sleep. Kana had a knack for that sort of thing, like many of the natives of Rhodesia. Some psychological or hypnotic power, perhaps inherited from their Voodoo-worshipping forebears.

Ballantyne flung aside the single purple flexifer sheet which covered him and stepped across to the east wall of his sleeping room. A panel slipped aside, revealing a swimming pool lined with white ferrolith tiles. The water gleamed and sparkled in the golden light of the early sun. His night tunic dropped around his feet and his slim, muscular body cleft the blue water like an arrow.

Presently he was finishing his toilet in front of a great mirror which formed one wall of the room and he eyed himself critically. Yes, he was as erect and strong as he had been fifty years before, when he took over the control of the International Ferrous Products Company from his father. His hearing was keen, his eyes bright, he had never known a day's sickness in his life. True, he thought as he brushed his hair in the customary double parting, there were signs of gray in the past ten years—since his son had left him. It was a good thing he had been able to keep that affair from the hearing of the Board of Control. They'd have made short work of the poor fellow.

Heaven knows he'd had enough to contend with, and now, just at the time when his eighty-five years entitled him to a little rest and pleasure, this ore shortage had to come up. He sighed and, turning from the mirror, picked up his tunic and flung it over his shoulders, just as a voice came from the speaker on the table.

"Hurry up, John! Breakfast has been ready for an age and I'm hungry."

"Coming, my dear," he replied and stepping into a little car, like an elevator, he was swiftly carried to the dining pavilion overlooking the Hudson River. Here Rose, his only daughter, and Kana, his secretary and trusted friend, were already awaiting him.

She was hardly thirty and in the full bloom of her early youth. Her black eyes often snapped with fun, but her full red lips sometimes seemed to droop with a faint sadness as though the shadow of some past grief were haunting her.

She was dressed in the universal fashion of the times, which was in most respects similar for both men and women, save that while the tunic for men reached to the waist and was fastened by a light metal chain across the throat, that of the women was knee length and was held in place by two ribbons crossing the chest and meeting at the back of the waist. Tunic, breeches and sandals were often elaborately ornamented, especially in the case of young girls. The latest mode, which was exemplified in Rose's garments, included a high collar or ruff somewhat in the Elizabethan style.

In mild weather, both sexes wore the tunic hanging down the back by its retaining chain or ribbon, leaving the arms free, but on chilly days it was drawn forward to envelop the body. All garments being made of flexifer in one or more of its innumerable colors and textures, the wonderful non-conducting properties of which made it absolutely impervious to heat or cold, the uncomfortable and unsanitary undergarments of past centuries were no longer necessary. Besides this, the love of outdoor light, which was universal in the Age of Social Enlightenment, had so improved the average physique that few people were inconvenienced by moderate cold, and it was a common thing, in rainy weather, to see the tunic completely discarded for the pleasure of feeling the raindrops beating upon the bare skin.

Kana was a typical Central African Negro, short, heavy set and muscled like a Hercules. Highly intelligent and with a pleasing manner, he had become almost indispensable to Ballantyne during the three years they had been associated. Rose, however, did not share her father's high opinion of Kana. She submitted herself to sharp self-criticism for her attitude towards the Zulu, but was unable to overcome it. Viewed in the light of this unreasonable prejudice, Kana's intelligence became craftiness, his dog-like devotion and understanding affection for Ballantyne became self-seeking hypocrisy.

The financier kissed his daughter lightly on the brow, shook hands with Kana and sat down to a hearty breakfast.

"Kana told me you were going to get up early," said Rose, shaking her finger at him playfully. "Do you call this early?"

"The fact is, my dear, I could not sleep, and when I did get to sleep at last, I slept so soundly that Kana had to call me."

"What was the trouble, John?" asked Rose, anxiously. "You're not worrying about this conference, are you?"

"No, no, Rose, not at all!" Ballantyne answered quickly, though his light tone did not deceive the keen ear of his daughter. She knew that he was worried, but she also knew him too well and loved him too dearly to add to his worry by plying him with questions.

"I was talking to Lotus Grenville this morning," she said. "She called me from Jacksonville before I was out of bed. She's not looking at all well, John. I knew her guardian would be attending your old conference, so I asked Lotus to stay with me for a few weeks, but she said that she had made up her mind to go up to that little log cabin of hers near Jasper."

"Is she going by herself, Miss Ballantyne?" asked Kana.

"Yes, quite alone," replied the girl. "You know it's quite a trip from Florida to Jasper, away up in Alberta, Canada. She's flying her own two-seater, so that she may be free to come and go as she wishes.

"That's why she called me up so early. She was leaving then and called to ask us to put up her guardian while he is in New York. Will that be all right, John?"

"Certainly! By all means!" replied her father, rising from the table. "I was never very fond of Clifford Weatherby, but we can hardly refuse him our hospitality. Well, you must excuse us, my dear. It's nearly nine o'clock and we must be at the office by nine-thirty. Coming, Kana?"

"Ready, sir!" replied the negro, folding his napkin hastily.

AS Ballantyne's light plane, with Kana at the controls, rose vertically from the hangar, whose roof opened to release it, an ever-widening landscape lay spread beneath them. From an altitude of eight thousand feet (the level reserved around all large cities for the exclusive use of in-bound commuters), the rolling hills, the winding river and the verdant woods presented much the same appearance as they must have done to the first aerial voyagers, the pterodactyls, those grotesque reptilian forerunners of the birds, which did their share towards making the Triassic period hideous. But the similarity was one of contour and outline only, for the details which had been filled in to complete the picture by the handiwork of man, would have astonished the New Yorker of a bare two hundred years earlier. The pride of the twentieth century New Yorker in his city was proverbial and there was very little limit to the growth which was thought possible for the greatest city of the Western World, but even the most optimistic would have balked at the suggestion of an area increased by five hundred fold in a little over two centuries. Yet such an estimate would have fallen short of the truth.

Buildings of every conceivable size and architecture dotted the landscape as far as the eye could reach. If a giant could have placed one leg of an immense pair of compasses upon Central Park and, with the other leg, describe a semicircle having a radius of a hundred miles, its circumference would not have enclosed the City of New York as John Ballantyne knew it in the year 2200. Rapid transportation, already an accomplished fact in the days of the first Ballantyne, had, at that time, done little to transform the daily habits of man, but as the years passed there was born a growing realization of the fact that it was no longer necessary to crowd ten million bodies into an area so small and congested that health and happiness were virtually impossible.

If the earliest effect of "The Law of the Triangle" in shortening the necessary hours of labor produced an almost revolutionary transformation in the life-habits of mankind, its corollary, the cheapening of rapid transit, had results equally surprising. Residential districts began to spread over larger and larger areas until it was no uncommon thing for workers to live at distances of a hundred miles or more from their places of business. The "Back to Nature" movement which originated in the twentieth century became an accomplished fact in the twenty-second, because each man could place his house as far from those of his neighbors as he wished, and surround himself with such combinations of natural beauty in mountain, lake or sea, as only the wealthiest could have afforded under the old, discarded system. Fictitious land values, created as the direct result of crowded cities, passed out of existence when traffic regulations were altered to permit of speeds up to two hundred miles per hour on the ground and four hundred in the air.

Ten minutes after leaving the Eyrie, Ballantyne and Kana passed over the great Windsor playgrounds and reached the outskirts of the business portion of New York. The mighty canyons and mountainous skyline which were the pride of early New York had passed into the limbo of forgotten things and in their places were huge buildings of carven ferrolith, rarely more than two stories in height, but covering an immense extent of ground. Far to the east, the huge bulk of the Central Distribution Building flashed like a great sapphire from its vantage point on Ellis Island. Here an endless procession of freight planes from all parts of the world discharged loads of wealth for distribution to the factories. True, the introduction of transmuted iron had tremendously decreased the demand for natural products, but there still remained many substances which could not be replaced by any form of iron. The successful production of synthetic food, one of the latest inventions before the Age of Social Enlightenment put a stop to scientific progress, was a barren discovery, for man still preferred to let nature grow his food!

Countless thousands of planes of every size, from the tiny two-seaters to the huge machines of the interurban lines, were converging from every direction, and Kana was obliged to use all his skill to cut his way out of the traffic stream at their destination. Near the center of the city was a small, highly ornate building of crimson ferrolith, bearing on its flat roof the name *"International Ferrous Corporation—Central Offices."* When directly above this building, Kana allowed the plane to fall vertically, the lifting helices idling on their shafts. When about five hundred feet above the roof he pressed a button. A siren mounted on the bottom of the plane emitted a blast of sound at a frequency so high as to be inaudible. A diaphragm on the roof, tuned to the particular frequency of Kana's siren, served to close the circuit of a small motor which, in turn, swung open two panels, revealing Ballantyne's private hangar, into which Kana dropped as lightly as a feather and with the finish and accuracy of the trained flier.

As the financier stepped out of the plane into a small luxuriously furnished waiting room, he was greeted by a little man whose outstretched hand and broad smile gave an effect of cordiality which was weakened by his shifty, light gray eyes and the unpleasant cast of feature which were almost fox-like in their cadaverousness.

"Glad to see you again, Ballantyne!" he exclaimed effusively. "You're still as healthy looking as ever, in spite of your years."

"I wish I could say the same for you, Weatherby," replied the other, shaking hands. "You look as though you were working too hard."

"It's a choice of working or starving," the little man replied fretfully. "If I wasn't wide awake, I should soon lose the little I have accumulated, what with these new regulations the Board of Control have put into effect. They don't seem to realize the privileges which are the just due of the wealthy."

"I'm afraid that your sentiments are a bit out of date," laughed Ballantyne. "But of course you don't mean what you say. Such ideas are contrary to the Law of the Triangle!"

"I'm not in the habit of saying what I don't mean," snapped Weatherby, irritably. "However, I didn't come up to discuss obsolete laws but to thank you for your invitation to stay at the Eyrie. I regret that I am obliged to decline, as it will be impossible for me to leave the Florida mines for longer than one day."

"That's too bad," replied Ballantyne amicably. "From what your ward said, Rose and myself were looking forward to having you with us for a few days. However, you know your own business best."

The three men stepped into a small private elevator and dropped two stories to the great assembly room, which was devoted to business conferences amongst the department chiefs in the huge corporation of which Ballantyne was president and manager. This hall, which covered the entire second floor of the building, was as unlike the average "directors' room" of the early days as can possibly be imagined. It resembled a palatial rotunda in some great hotel. Deep carpets of crimson ferrovell covered the floor. Cushioned chairs were scattered at intervals without any attempt at formal arrangement. The view, unobstructed save by a single row of delicate columns, showed on one side a vista of gardens, trees and fountains. On the other side was the sea, its clear waves, unsullied by the defilement which was universal in the days of ocean liners, lapped the very foundations of the building and glistened cheerfully in the morning sun.

When Ballantyne, Kana and Weatherby stepped into the room, it was already filled with an assemblage of men and women, whose brilliantly colored tunics gave the impression of a social gathering rather than of a solemn business conclave. Here were the representatives of the transmuted iron industry with its numerous branches from all parts of the world. There was La Bissoniere, manager of the French Flexifer factories; Von Esterholtz, president of the German mines; Ho Cheng, suave and inscrutable, from the Chinese division; Beecham, the tall blond Englishman, and a hundred others.

AMID the blaze of rainbow hues, three figures stood out in marked contrast. Two were men, one a woman. They alone of the assemblage were clad in pure white, unrelieved by any ornament save for a large triangle embroidered upon the back of each tunic, in the three primary colors of the spectrum, blue, red and yellow. They were Hector Shawn, Kanzo Singh and Felice Mincheau, "The Three" who were for that decade joint presidents of the Board of Control. They had broken all precedents by leaving the confines of Santa Lucia to attend this meeting, realizing that, for the first time in nearly two centuries, the happiness and prosperity of the world were at stake.

The crowd parted respectfully to allow Ballantyne to cross the room to where the Three were seated. They rose as he approached and each greeted him with a warm handclasp and the salutation, "Your wish!" the phrase which had largely displanted the old-fashioned "How d' you do?" in these days, when universal good health had rendered the latter expression redundant. The modern greeting is, of course, an abbreviation of "May you have your wish!"

"Eight years have passed since last we saw you, John Ballantyne," said Shawn. "They might well have been eight rose petals for all the change we see in you."

"What should the years be but rose petals," returned Ballantyne lightly, "when I have a rosebud—my daughter Rose—to watch over my happiness?"

"And your son?" queried Felice Mincheau, "Ralph, is it not? Soon he will be ready to take the burden from your so heavily laden shoulders!"

A fleeting shadow passed over Ballantyne's face.

"He is away on—on a visit," he replied, and then turning hastily to the tall Hindoo, "Your wish! Kanzo Singh. The time is not far distant when you will be free to return to your beloved garden in Nepal. The world can ill spare you."

"May the All Wise grant that the world have no greater troubles than such passing regrets!" said the Hindoo gravely. He pointed towards the sea. "The ripples glitter bravely in the sunshine," he said, "but when the storm rages, the ripples are forgotten."

Somewhere a bell chimed the hour with golden tones.

"Ten o'clock," said Ballantyne. "Will the Three honor me with their presence on the rostrum?"

He led the way towards a slightly raised platform at one side of the room. As the four moved, the groups of delegates broke up and sought seats. Clifford Weatherby, whose wealth and importance might well have justified his assuming a place on the platform, seated himself at the back of the room, close to the balcony which overhung the sea.

Kana followed Ballantyne to the platform, around which were grouped the reporters from the various telenewspapers. As he was about to step on to the rostrum, Ballantyne paused and looked fixedly at one of the reporters, a tall, handsome young man with very regular features and skin of a light brown. After a moment's hesitation, Ballantyne spoke.

"Your wish, sir! May I ask your name?"

"Your wish, Mr. Ballantyne," replied the young man, bowing. "I am Morton of the New York *Tele-Standard*."

"Forgive my abruptness, Mr. Morton. Your face reminds me of someone—someone I once knew.

The others had stood by courteously during this brief conversation, but as Ballantyne turned away, Kanzo Singh, with an instinctive feeling that the incident was not closed in Ballantyne's mind, spoke to young Morton quietly.

"You are from the Hindoostan Division, Mr. Morton?"

"Your wish, Kanzo Singh of the Three," replied Morton formally. "My mother was of the American Division."

"Ah! That accounts for your light skin and regular features," said the Hindoo. "And your father?"

Before Morton could reply to this question, Ballantyne called to Kanzo Singh to take his place and stood up to open the meeting. This he did with a total absence of formality, simply raising his hand and speaking in a quiet voice, which, thanks to the faultless acoustic construction of the ceiling, was audible in every part of the great room.

"As President of the Ironmasters of the World," he began, "it is my duty to receive reports from the various mines and oversee the distribution of the ore to the factories.

"During the past two years the nature of these reports has been more and more disturbing. I need hardly point out to you that since the discovery of allotropic iron by my great-great-grandfather, the material comfort and progress of the world has come to depend to a large extent upon the unhampered operation of the iron industry. To take one example, if some unforeseen catastrophe rendered the further manufacture of flexifer fabrics impossible, it would be many years before we should be able to revive the forgotten arts of weaving and spinning. In the meantime, it is not too much to say that the world would revert from civilization to a condition of naked savagery.

"The same reasoning applies to all the branches of

the iron industry. A shortage of iron would result in a shortage of all the necessities of life with the sole exception of food. Even foodstuffs could not be distributed in the absence of the machinery which iron alone makes possible.

"I spoke of the disturbing reports from the mines. What these reports signify you can judge for yourselves after hearing what the Departmental Chiefs have to say. Ho Cheng, will you describe what you have found in the Chinese mines?"

The Chinese engineer spoke from his place near the rostrum. Like Ballantyne he spoke without the meaningless preliminaries of olden days, coming straight to the point.

"Three years ago," he said, "some of the workers called my attention to a remarkable phenomenon. In several places in the Sun Kee mine, veins of ore which were being excavated by means of vertical shafts, came to an end suddenly, and below the magnetite was found a peculiar mineral with which none of us was familiar. I said that the ore came to an end suddenly, but I should rather have said that this unknown mineral blended and interpenetrated with the ore, as though the one were a product of the other.

"Chemical analysis revealed the surprising fact that the mineral was a sulphide of gold. This metal being practically valueless, the workings were, of course, abandoned and the men transferred elsewhere. About a year later, one of the Sub-Chiefs asked me to come and look at a certain shaft. It was the first shaft in which the sulphide of gold had been found. What was my surprise to find that the sulphide had spread upward, almost like a disease, the upper level being now twenty feet above the bottom of the shaft!

"Since that date we have made careful inspection of all mine shafts in the Chinese division and have found that the whole body of iron ore wherever distributed throughout western Asia, is slowly being converted into sulphide of gold from below. What is causing this change we have not been able to ascertain, but, as I have said, it seems to partake of the nature of a disease."

George Beecham, the tall, blond Englishman, rose.

"Conditions in the English mines are substantially the same as those reported by Ho Cheng. The ore is slowly being destroyed from below. I may add, however, that we have discovered that this disease is apparently like the germ diseases of the past. It is infectious by contact. A sample of ore taken from a point ten feet above the advancing sulphide and kept in a glass tube, remains unchanged until the present time, although the infection has long since advanced past the point from which it was taken."

"I can add one more observation," said La Bissoniere. "We have made a careful study of this gold sulphide in the French division and we find that it is simply what it appears to be: sulphide of gold. We had some hopes that it might be merely some form of transmuted iron with the properties of the gold compound. This hope is without foundation. The mineral is worthless and we can only stand and watch billions of dollars' worth of iron ore vanishing before our eyes."

ONE after another the mine chiefs added their quota to the alarming news and as each speaker concluded his brief report, amazement and consternation became more apparent upon the faces of the listeners. The extreme seriousness of the situation might have failed to impress the world of the twentieth century when commercial products were so immensely diversified that the total destruction of any one of them would have resulted in little more than a passing depression, but with the discovery of allotropic iron, the world had put all its eggs into one basket. The apparent inexhaustibility of the ore deposits justified the belief that the basket was reliable. Then, out of a clear sky, or rather out of the bowels of the earth, came this mysterious disease which was consuming the one substance upon which civilization depended, much as leprosy and cancer, those horrible, obsolete plagues of the past, consumed human flesh.

When the last of the mine chiefs had said his say and taken his seat, there was silence for some few moments and then Hector Shawn rose and came to the edge of the rostrum. Of the three, Shawn, the big, swarthy Irishman, was the best qualified to grasp the seriousness of this world crisis, for he had been a mine chief under Ballantyne before he was appointed to a share in the highest office in the Board of Control on the island of Santa Lucia.

"You have heard," he said, incisively. "You understand. There is no need for discussion. Discussion is wise only when there is a choice of paths. In this matter we have no choice. We must save whatever portion of the untainted ore remains. The Three will call for volunteers to aid the mine workers in removing the ore as quickly as possible and storing it in some place safe from infection. While this remnant is being consumed, we must go back to the habits of our forefathers and learn to grow wool and cotton, to weave and to spin. We must grow new forests of pine and oak. We must train carpenters and stonecutters. We must study all the arts which flourished in former centuries and train our children in the practice of them.

"I have spoken. Is the Three in accord?"

Kanzo Singh and Felice Mincheau raised their arms in a peculiar gesture, placing the thumbs and forefingers of the hands together to form a triangle. It was the sign of official assent. Shawn acknowledged it by a similar motion and resumed his seat.

The Three had spoken. They had met the crisis and passed judgment in accord, as they and their predecessors had passed judgment innumerable times in the past. There remained nothing further to be said or done. The assembled delegates were content, all save one. Morton, the young, dark-skinned reporter, rose hesitatingly to his feet and faced the rostrum.

"Will the Three grant me leave to speak?" he asked, modestly.

"Speak!" replied Shawn.

"The Three has passed judgment in accord," said the young man quietly. "Not for two centuries has any man questioned a decree of the Three in accord. But not for two centuries—no, nor for twenty centuries has the world faced a crisis like this. Shall we sit supine and raise no hand to keep the civilization which we have built up since Walter Ballantyne explored the secret places of science so long ago? Does not science still hold secrets which are greater than any she has revealed in the past?

"It is said that there is a society of scientists known to its members as 'The Rebels.' Who knows but that these Rebels may make some new discovery which will restore to us our iron mines or provide new sources of transmuted iron? Let us appeal to them. Let us——"

His speech was abruptly cut short. Kanzo Singh, who had with difficulty controlled his indignation, sprang to his feet and towered with outstretched arms and flashing eyes above the unfortunate reporter.

"Silence!" he roared. "O, impious young man! It is well for you that your youth and inexperience disposes the Three to leniency. Is it not written in the Sacred Books of Science that nothing shall be added to or taken from the divine revelations which our forefathers have handed down to us? Have not our wise men said that there is no remedy for this plague which is destroying our mines? Shall we question their knowledge?

"As for these Rebels who would tamper with the appointed body of science, would that the Three could lay hands upon the accursed heretics and wipe them from the face of the earth they defile by their presence!

"I have spoken! Is the Three in accord?"

Again the Three gave the sign of the Triangle. There was a murmur of approval from the listeners. Faces showed every degree of emotion from disapproval to horror. Only John Ballantyne ventured a glance of sympathy at the young man who had dared to brave the anger of the mighty Three; who had flung his convictions in the teeth of universal public belief. Somehow he found his memory harking back to that day in the Eyrie when another young man, his dearly loved son, had left him forever, rather than give up the pursuits he loved. He saw him again, as he tightened his muscles in a grim determination to continue unhampered in his scientific research and experimentation—until such time when the world would realize the value and need of such work.

Meanwhile Clifford Weatherby, the little Florida financier, had risen in his place by the balcony and was speaking.

"The Three has done well in crushing this vile heresy in the bud," he exclaimed harshly. "It will be a sad day for the world when freedom of speech is extended to the point where such opinions are tolerated. Nevertheless, I crave permission to make a suggestion. It was taught in the old days that the welfare of mankind rested in the hands of the wealthy. Surely we have not outgrown this splendid teaching! I declare without hesitation that this great crisis is a divinely sent opportunity to re-establish the rule of Capital. Let us do as the Three have ordained, but let us go a step further. Let us hold what iron remains to us and sell it to the highest bidders.

"With the wealth of the world in our grasp we, rulers by the divine right of wealth, can resume once more the supreme sway which is our right."

If the heretical speech of the young reporter awakened indignation in the breasts of his hearers, it was as nothing to the wave of horror which swept across the assembly at Weatherby's words. The destruction of the iron mines meant poverty, but Weatherby's inhuman suggestion meant anarchy!

The accustomed calm was broken by shouts of fury.

"The Triangle! The Triangle! We invoke the Law of the Triangle!"

Men and women surged towards the wizened figure of the little Floridian who stood grinning and gnashing his teeth impotently.

"In the name of the Triangle, seize that man!" came Hector Shawn's deep voice.

A dozen men and women converged towards the balcony, Morton, the young reporter, among the first. A dozen arms were stretched out to grasp the vulpine figure which stood shaking its fist and trembling, by the pillars overlooking the sea.

But before a hand could be laid upon him, Weatherby turned and with surprising agility, leaped to the balustrade, stood poised there for a moment, then sprang into space.

There was a rush to the balcony. Heads craned over expecting to see the mangled corpse of the financier upon the rocks two hundred feet below. Instead, there was a tiny plane, hovering on its slowly turning helices. Weatherby was in the act of climbing into the seat by the pilot.

He looked up at the line of angry faces and shook his puny fist once more. Then the plane rose like a rocket and hurtled out towards the open sea.

Clifford Weatherby had shown his qualities as a strategist by covering his retreat!

CHAPTER V

Beneath the Glacier

THE afternoon sun beat down from a sky of cloudless sapphire into the hidden valley in the heart of the Canadian Rockies. Over the spotless snowfields, the heat shimmered with an almost intolerable glare. The contour of the nearer rocks stood out with lunar distinctness in the intense contrast of light and shade, but in the middle distance, the cliffs and buttresses veiled themselves in the heat haze like a woman who adds to her allurements by half concealing her charms.

Ralph Morton avoided the reflected rays as much as possible by keeping to the centre of the glacier where a longitudinal band of gravel and small stones formed a medial moraine. This moraine, composed of débris from the cliffs at the head of the valley, formed a pavement of such exceptional smoothness and regularity that it almost resembled a road, save that at intervals its progress was broken by small transverse crevasses, caused by irregularities in the bed rock over which the ice was obliged to flow, just as hidden sandbars in the bed of a stream cause ripples on the surface of the water.

Ralph swung along at a steady pace in his high climbing boots and jumped the occasional crevasses, none of which were more than a couple of feet in width. He whistled blithely to himself, rejoicing in the first freedom from work which he had permitted himself for nearly a month.

He, Geoffrey and Dr. Umetaro had mutually agreed to take an afternoon off and now each of the friends was spending it in his own way. Geoffrey was taking a long flight over the barren lands of the north; the Japanese doctor had elected to sit on the balcony of the workshop and meditate; while Ralph had taken his ice axe and gone for a tramp to the great icefalls at the head of the glacier.

Ralph's eyes were on the sublime scenery which surrounded him, but his thoughts were on the stirring events of the past four weeks. They passed in panorama before his mind, each seeming to be a step towards the attainment of a boyhood ambition, until now he was faced by a blank wall which rendered further progress impossible.

When he and Geoffrey came to this secluded spot and built their aerial workshop, they had only the most indefinite plans for the future. They were stimulated by an unaltering determination to break down the artificial barriers with which man had surrounded the natural sciences, declaring "Thus far shalt thou go and no farther!" Just as the devout in past ages believed that religion was a complete revelation, so in these days, the dawn of the twenty-third century, man believed that science was finished. They studied the ancient writings and utilized to the full the teachings of the great scientists of the past, but the idea that science was susceptible to further progress was utterly abhorrent to them.

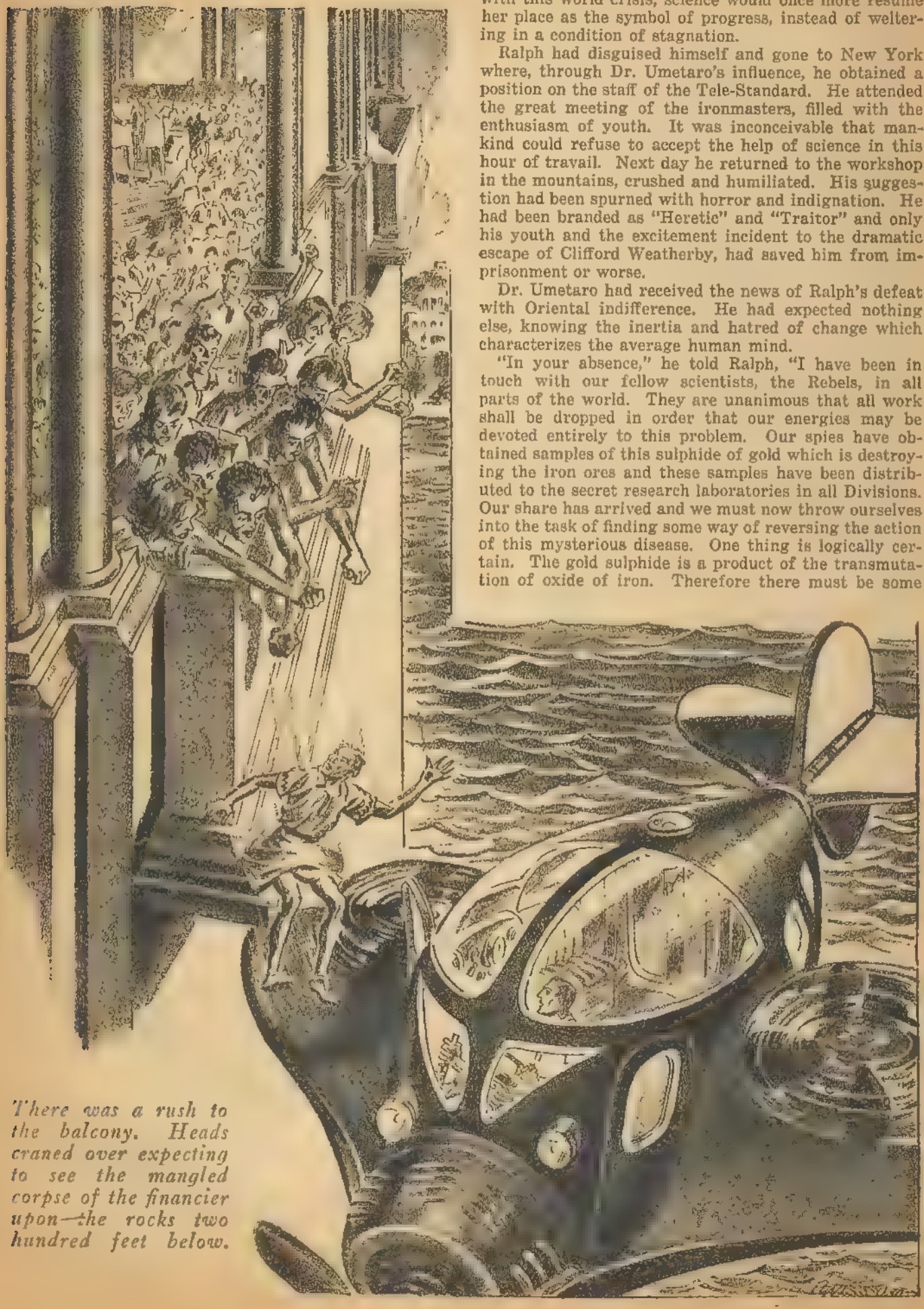
Ralph and Geoffrey were scientific freethinkers. They longed to break down these artificial barriers and show to the world by some great discovery that infinite possibilities still lay hidden in the womb of Nature. This supreme ambition sustained them through the years of preliminary study. At last they had decided to concentrate their efforts on the mysterious problems of life and growth. Then came Ralph's encounter with Dr. Umetaro in Denver. The young student snatched at the chance of enlisting the Japanese surgeon in the work which they had undertaken, but before the new partnership could begin to function came the news of the sudden shortage of iron ore and the three friends realized that their great chance was before them. If they could

demonstrate that science and science alone could deal with this world crisis, science would once more resume her place as the symbol of progress, instead of weltering in a condition of stagnation.

Ralph had disguised himself and gone to New York where, through Dr. Umetaro's influence, he obtained a position on the staff of the Tele-Standard. He attended the great meeting of the ironmasters, filled with the enthusiasm of youth. It was inconceivable that mankind could refuse to accept the help of science in this hour of travail. Next day he returned to the workshop in the mountains, crushed and humiliated. His suggestion had been spurned with horror and indignation. He had been branded as "Heretic" and "Traitor" and only his youth and the excitement incident to the dramatic escape of Clifford Weatherby, had saved him from imprisonment or worse.

Dr. Umetaro had received the news of Ralph's defeat with Oriental indifference. He had expected nothing else, knowing the inertia and hatred of change which characterizes the average human mind.

"In your absence," he told Ralph, "I have been in touch with our fellow scientists, the Rebels, in all parts of the world. They are unanimous that all work shall be dropped in order that our energies may be devoted entirely to this problem. Our spies have obtained samples of this sulphide of gold which is destroying the iron ores and these samples have been distributed to the secret research laboratories in all Divisions. Our share has arrived and we must now throw ourselves into the task of finding some way of reversing the action of this mysterious disease. One thing is logically certain. The gold sulphide is a product of the transmutation of oxide of iron. Therefore there must be some



There was a rush to the balcony. Heads craned over expecting to see the mangled corpse of the financier upon the rocks two hundred feet below.

process by which it can be restored to its original form.

"And now, to work! Knowing that our efforts are being supported by a thousand eager hands and brains wherever the Rebels are found."

A MONTH later the enthusiasm of the three friends was undimmed, but their optimism was sadly diminished. They subjected the sulphide of gold to every reagent and treatment, physical, electrical, chemical and radiological, which their combined ingenuity could devise, but without a trace of success. The Doctor, who kept in constant touch with the Headquarters of the Rebels by means of a portable radio set which he had brought from Japan, had nothing but negative news to report. Iron still remained the master element. It alone was capable of endless varieties of allotropic forms. Gold was practically worthless. It possessed properties of resistance to corrosion and ductility, which rendered it useful in certain very restricted fields, as, for example, for cooking utensils, but that was all that could be said for it. As a substitute for the widespread uses of iron, it was unthinkable.

Must the world pay for its marvelous social advancement by a corresponding setback in material civilization? Was there no remedy for the loss of the iron mines save the retrograde policy decreed by the Three? Was it possible that science would fail her worshippers in the hour of their need?

Such thoughts as these passed through Ralph's mind as he followed the winding course of the great ice-river. Presently he rounded a bulging buttress of grey rock and entered the confines of the huge amphitheatre in which the glacier had its source.

Science and the world crisis were driven from his mind by the transcendent beauty of the scene. In the centre rose a pinnacle of black limestone carrying a horizontal band of red strata, like a dagger of obsidian inlaid with rubies. On one side of this turret an ice-fall glittered in the sun with a riot of prismatic hues; on the other a curtain of virgin snow seemed to hang pendant from the peaks, its spotless surface sweeping down in a wealth of gracious curves, which would have put the sculptor's art to shame.

Ralph's eyes took in the magnificent panorama of rock and ice and snow with a rapture which lost none of its keenness with familiarity. He had climbed that black dagger by a dozen different routes. He had threaded his way through the tangled maze of the ice-fall to the frozen summit of the peak it guarded. He had plodded up that shining snow-curtain and over the ten thousand-foot pass which led into the adjacent valley.

He allowed his vision to travel slowly up the white curves, living again in recollection the happy days he had spent amid their unsullied expanses. Suddenly his attention was fixed by a moving speck, a spot of pale blue, which on closer inspection resolved itself into a human figure working its way down the steep slopes below the pass.

His surprise was mingled with dismay. He and Geoffrey had chosen this wild valley for their workshop and laboratory, secure in their belief that no other human being was likely to intrude upon their privacy. Was this privacy to be broken in upon by curious outsiders? At this time, of all others, the result of discovery might be disastrous. Once the Three got wind of their investigations, Ralph and his friends would be forced to flee, or face the certainty of imprisonment as disturbers of the world's welfare.

Ralph pulled out a light telescope from a pocket of his tunic and examined the distant figure, which was slowly but steadily descending towards him. It was a woman; a young girl, apparently. As she drew nearer, he could see that her body was that of a young Diana, lithe and beautiful. Poised like an eagle in full flight, she carried her head with boyish alertness. The softly blending contours of her throat and breasts echoed the gracious curves of the snowfields that she was descending. Her skin was burned to creamy tan by exposure to the ardent sun of the northern summer. She braced herself with skill and confidence by means of her climber's axe as she drove her heavily booted heels into the yielding surface of the steep snow.

As Ralph watched her, the girl reached a point where the slope eased off into the borders of the curtain, whose hem rested upon the glacial ice a hundred yards from where he stood. She was now near enough so that she was distinctly visible without the aid of the glass. Ralph saw her stop, transfer her ice axe to the other hand, and rest its point upon the slope behind her. Next moment she was skimming down the snow like a feather, body erect, one foot advanced, the other knee bent, in the graceful "standing glissade" of the born mountaineer.

Ralph's instinctive admiration was changed into a thrill of horror as he realized that the girl was sliding to almost certain death. At one point the "hem" of the snow curtain, instead of resting upon the level ice, was separated from it by a great crevasse or "bergschrund" as it is known to climbers. The intrepid climber was flashing down into the jaws of this abyss, whose depths might reach to the very bottom of the ice.

Shouting warnings, Ralph started to run towards the bergschrund. There was a good chance that the girl could stop herself in time to avoid the threatened disaster, but the very thing which was her only hope of salvation, proved to be her undoing. Believing herself to be alone, the sudden outburst of sound disturbed the delicacy of her balance. She turned her head. The axe was whipped from her grasp. She tripped, fell forward, lost all semblance of control. She shot downward with ever increasing speed until she passed over the lip of the crevasse and vanished into the indigo depths, just as Ralph ended his mad race at the near edge.

He flung himself face downward upon the ice, frantic with dismay. It was incredible that this fair girl, the living embodiment of joyous health should, in the flash of an eye, have been hurled into Eternity. Was it possible that she still lived? Dared he entertain a trace of hope after such a fearful plunge? He shouted. There was no answer but the slow drip of water falling into a mystery of purple shadows.

Yes, there was a faint chance that the girl might have escaped instant death. Just below the trough, which marked the course of her helpless body down the snow-slope, the wall of the bergschrund instead of being vertical, followed the angle of the slope above, thus forming a projection, something like the flying buttresses which jut out from the walls of old cathedrals. If by some miracle the girl's helpless body had followed the course of this narrow ramp, whose lower end was hidden in gloom, and had landed upon the pile of avalanche snow which often choked the bottom of such crevasses, there was a bare possibility that she might have survived. Perhaps, even now, she was regaining consciousness, only to be faced with the terrible certainty of death by freezing.

Ralph had no intention of leaving the spot until he had rescued the girl or made certain that she was dead. He would descend into the bergschrund no matter what the risk.

Everywhere the icy walls fell away sheer, save for the ramp and that was on the opposite side of the crevasse, which gaped to its full width of a dozen yards along the whole breadth of the mountain. At one place a frail bridge of frozen snow, the remnant of some avalanche which had filled the bergschrund earlier in the year,

spanned the gulf and offered the only means of gaining the top of the ramp.

RALPH had crossed many such bridges in the past. He had descended slopes of slippery ice fully as steep as that awful ramp. It was one thing to face such perils with trusted companions to whom he was united by means of the alpinists' rope and quite another thing to take his life in his hands alone, with the certainty that a single mis-step spelled sure death.

He crossed the bridge sprawled out at full length to distribute his weight. More than once he felt the snow settle under the strain. At last with a gasp of relief, he dug his axe into solid snow and drew himself to safety.

If the crossing of the snow bridge had seemed to occupy a lifetime of suspense, surely the descent of the ice ramp must be measured in terms of eternity! The steps he cut were little more than niches for the nailed edges of his boots. The cutting of each new step represented new tortures of insecurity; periods during which the stability of his balance was constantly threatened by the necessity of leaning down to swing the axe.

Fifty, seventy, a hundred feet. His difficulties were increasing with every foot, for the gathering darkness and the weird, unreal shadows, tended to make his equilibrium even more uncertain. The bergschrund was wedge-shaped and the walls were closing in on him. The farther wall was now a bare three yards away.

He peered down, but could distinguish nothing. The narrowing walls added a new horror to a situation already terrible enough. What if the girl were lying crushed between the jaws of ice, head downwards, still living, but held in a grip from which it would be impossible to extricate her?

Chip! chip! chip! The splinters of ice tinkled down and disappeared into silence and darkness. Suddenly, when he was beginning to wonder how much longer his tortured muscles could stand the strain, he swung his axe to cut one more step and its blade encountered something soft. For a moment he tottered helplessly, struggling to regain his balance, and then plunged head foremost into a pile of wet snow.

He sat up and looked around him. For a few moments he could distinguish nothing. Then his eyes became accustomed to the dim, ultramarine light and he saw the body of the girl lying close to where he had fallen, a pitiful little crumpled heap.

He placed a hand over her heart and felt a faint throb. She was alive! Snatching off his tunic, he wrapped it around her and began to chafe her icy hands and arms. Presently he was rewarded by a sigh, followed by a slight movement.

How lovely she was! But how fearfully white, save where a smear of crimson blood marred her forehead and matted the tendrils of her fair hair. He slipped one arm around her shoulders to raise her from the snow.

At the touch, her lashes trembled and then rose, revealing eyes like the petals of a purple pansy; eyes which looked at him in wonder and then with amazement and fear.

"Oh! Where am I? What has happened?" she murmured.

"Don't be frightened," said Ralph, reassuringly. "You had an accident, but you're safe now."

"I—I don't understand. I was coming down from the pass. Someone shouted and then I fell. Was it you who shouted? What is this awful place?"

"Yes, I shouted to warn you," said Ralph, continuing his efforts to restore circulation. "There was a bergschrund at the bottom of the slope and you fell into it. You shouldn't glissade a slope unless you know where it ends, you know," he added sententiously, "there's nearly always a bergschrund where a snowfield joins a glacier."

"Thank you so much for telling me," said the girl, with a faint touch of satire, softened by a most adorable smile. Ralph was beginning to think that life was well worth living, even at the bottom of a glacier, when beautiful girls smiled at one like that!

"Are we at the bottom of the bergschrund now?" she asked, "And how did you get down here?"

"I came down the same way you did," Ralph answered, "only not quite so fast. I had to cut steps and it took a long time, I'm afraid."

"Well, I really had begun to wonder what was keeping you," said the girl with a little choking, hysterical laugh. "I th-th-think you must have saved my life." She burst into an agony of tears and buried her face on his shoulder, while he patted her golden curls and murmured incoherent phrases of comfort.

Presently she raised her streaming eyes to his.

"I'm sorry. I did make several kinds of fool of myself. Please forgive me. You see, I haven't made a habit of falling into bergschrunds. This is my first attempt and I seem to have made rather a mess of it."

"You're not hurt, are you?" asked Ralph solicitously.

"No, thank you," she replied. "At least, I don't think so. Will you please help me up?"

With Ralph's aid, she struggled to her feet and stood looking around.

"No bones broken. Bruise on one knee and an awful headache," she summed up. "Not so bad for a first effort. Oh! I've got your tunic! You poor fellow, you must be frozen. No, I insist on your taking it. I'm perfectly warm now."

Ralph experienced little unfamiliar tremors in his spinal column as she wrapped the tunic around his shoulders and fastened the throat-chain by means of the carved name-plate, which was universally worn, by men on the front of the neck, and by women at the intersection of the breast-ribbons.

"And now, Ralph Morton, what about getting out again?" she said.

Ralph glanced at the triangular golden plate on her bosom. It bore the name "Lotus Grenville." Lotus! Where had he heard that name before? Such an uncommon name and yet so perfectly in harmony with its bearer. She shone in that awful place like some glorious tropical blossom in the last gleam of twilight.

"If you are strong enough, Lotus Grenville," he replied, as he took her hand, his lips lingering over the name with the sensation of a caress, "we will try to solve that problem."

Ralph faced the problem of their escape with the same matter-of-fact courage with which he had tackled the descent of the ice-ramp, but with even less hope of success. He knew that he could return by the way he came, but as for taking Lotus up those appalling steps, he dismissed the idea without a moment's consideration. If his splendid muscles had almost failed him on the descent, what chance was there of Lotus reaching the top, shaken and exhausted as she was by her terrible experience.

"I shall have to explore a bit," he said, cheerfully. "Do you mind being left alone for a few minutes?"

"Of course not, Ralph," the girl replied, bravely. "You won't be long, will you?"

"Not a second longer that I can help. I want to find the easiest way up."

The pile of soft snow upon which Lotus had fallen filled the space between the two sides of the bergschrund which, at this point, was about eight feet wide and ran in both directions like a narrow passage with walls of purple ice a hundred feet in height and a ceiling of blue sky and white, drifting clouds.

RALPH started eastward along the passage, hoping that he might find some narrow place filled with snow, up which he might scoop a ladder of steps to the surface.

Almost immediately he found himself descending the mound of snow and he set foot on solid rock, the actual bed of the glacier, polished to the smoothness of a ferrolith pavement by the slow, eternal progress of the ice-river.

As he continued along the length of the bergschrund, he noted with some surprise that the rock of which the pavement was formed, differed from any mineral which he had ever encountered in his long experience of geology. Even the urgent nature of his quest for freedom could not entirely suppress the enthusiasm of the scientist and he stooped down to feel the rock. It had the slightly greasy texture of soapstone and was brilliant amethyst in hue. He noted that the nails of his boots bit into the rock as though it were chalk.

With a couple of blows of his axe, he cut loose a fragment of the mysterious mineral and slipped it into the pocket of his tunic.

Presently he heard the sound of running water and found a small stream which cascaded down the wall and ran away eastward. Ralph continued for some time in the same direction, splashing through the running water which was constantly augmented by additions from above. When he reached a distance from his starting point which he estimated at about half a mile, the shining walls began to draw closer and closer until he could span them with outstretched hands. Now or never he must find some means of exit from the abyss.

Closer and closer came the walls until he could barely find room for his shoulders and then, just as he was about to abandon hope and turn back, the right hand wall took a sharp turn, the passage opened out and he found himself standing at the bottom of a great circular pit. The slippery walls rose sheer and glistened wetly in the reflected light of day. A welter of spray filled the huge pit, like a giant's showerbath. His ears were assailed by the muffled roar of the falling water.

He was standing in what is known to climbers as a *moulin*, or mill, circular shaft in the ice, generally found at the junction of several smaller crevasses. Such moulins serve to carry the drainage from the surface of the glacier to the bedrock below. Every mountaineer is familiar with them, but Ralph was certainly the first man to reach the bottom of one alive.

His amazement and admiration for the weird beauty of his surroundings was suddenly arrested by the sight of a low archway on the farther side of the moulin. Semicircular in outline and perhaps five feet in height, it cut into the ice like the entrance to a tunnel, and as he peered through the swirling spray, he could see the floor of the tunnel as a rushing torrent of water.

In a moment he realized the origin of the strange passage, and his heart leaped at the hope of escape which it afforded. Wild and improbable in the extreme, still it was a hope.

The archway, whose perfection and symmetry gave it the appearance of man's handiwork, was the result of the friction of the water, in its mad race for the open. In the tongue of the glacier, far down the valley, was a great cave, from which emerged the river which watered the forests of the lowlands. This tunnel was one of many such natural passages which converged to the great cave and fed the river.

There was one chance in a thousand that the tunnel might be passable throughout. Any one of a hundred things might result in failure or even disaster, but they must take that slim chance and pray the All Wise for a successful outcome to the mad enterprise. Ralph turned and hurried back along the amethyst pavement to where he had left the girl.

As he drew near, he shouted to apprise her of his coming. There was no reply. Fearful lest some further accident might have befallen her, he broke into a run.

Lotus was lying on the heap of snow, her fair head pillowed on one outflung arm, her eyes closed. Her display of strength had been a flash in the pan, a brave effort to deceive Ralph and encourage him in what she believed to be a hopeless enterprise. The blow on her head had been more serious than he realized, and no sooner had he left her than she relapsed into unconsciousness.

If they stayed there, there was no prospect save death. First Lotus and then he would yield their lives to the chilling breath of the ice. There was only one thing to do and he did it.

Having wrapped her once more in his tunic, he picked her up in his arms and started back along the bergschrund. When he reached the great shaft, he edged his way around the wall, almost blinded and beaten down by the pitiless force of the spray, until he could enter the archway.

At first, the torrent in which he waded was barely ankle deep, but his difficulties were increased by the necessity of stooping to avoid striking his head against the low roof.

He struggled on in the unearthly purple light which filtered feebly through a hundred feet of ice. He could barely discern the lovely face which glimmered white and ghost-like against his breast. Presently the tunnel grew higher and he was able to walk erect, but now the torrent was knee deep and its force constantly threatened to carry him from his footing.

Often he passed the openings of other tunnels, each of which added its share of icy water to swell the torrent. Now it reached his waist and he was obliged to call forth his last reserve of strength to lift his burden above the surface. The dim light was growing dimmer and blending into crimson. Far above his head, the world was glowing in the luminescence of sunset. Would he ever see another sunrise or would night find two frozen lifeless bodies?

His limbs were growing numb with cold and fatigue. He passed another tunnel. The water was up to his breast and he tried in vain to raise the girl's inert body above it.

The effort sapped the last trace of his strength. He strove in vain against the raging torrent which beat against his back. Suddenly his feet were carried from under him. Convulsively he clasped the girl to him. His senses were blotted out and the two bodies were hurled forward beneath the glacier, clasped in the embrace of death.

CHAPTER VI.

A Cupid from Japan

NOW dimly, now clearly, like visions of verdant valleys seen through rifts in a drifting sea of cloud from a mountain top, consciousness came back to Ralph Morton.

At first, it was hardly more than the smeared pictures of dreamland, forming and fading like ripples on the surface of a woodland pool, a pool reflecting a jumble of blurred images, of which only one possessed sufficient cohesion to enable it to persist for more than a moment —the image of a mass of golden curls; a pair of eyes, pansy-purple; a face, chiselled with the delicacy and charm of an oriental carving in alabaster, but white.

terribly white, whiter than any alabaster, save for that trickle of crimson blood upon the brow.

Gradually the images grew clearer, less dreamlike, until he became conscious of the awareness of life, of self; a consciousness unmingled as yet with the desire or even the power of physical movement. Now he realized whence came that persistent image. Hesitatingly, as one who experiments with a paralyzed muscle, his lips formed themselves into a name: "Lotus!"

He remembered the fearsome descent into the depths of the bergschrund, the staggering progress through the icy tunnels, the hopeless struggle with the numbing torrent. Was this Death? Were these images the first sensations of a disembodied spirit? Surely no flicker of life could have survived that raging torrent.

Tentatively he raised his eyelids. Still the image of that fair face persisted, but now the alabaster was tinted with rose. The high forehead, a little drawn as though in anxiety was no longer marred with blood, but the golden curls were bound with a white bandage. The purple eyes brooded over him with the alert watchfulness of a mother.

"Lotus!"

This time his voice kept time with his lips. At the word, the tense face relaxed. The eyes were irradiated with a smile, whose joyousness overflowed those purple pools and curved the lips into a scarlet bow.

"Ralph! Oh, Ralph! You've come back. Geoffrey! Dr. Umetaro! Come quickly! He's conscious!"

The full realization of life burst over him like a flood of happiness. He lay on his sleeping couch on the roof-space of the workshop. The yellow flexifer awnings were drawn back revealing a cloudless summer sky. He felt no pain, but his head seemed numb. Putting up his hand, he encountered a mass of dressings.

"You mustn't touch your head!" Lotus exclaimed, and he thrilled to the touch of her hand as she laid it arrestingly on his. "You were terribly hurt, Ralph, but you'll soon be better now."

"What happened?" Ralph murmured. "How did we escape from the glacier?"

"Dr. Umetaro saved us, as you saved me, Ralph!" said the girl, her eyes glowing. "Your head must have struck something. You've been unconscious for three days. We—your friend Geoffrey has been almost crazy for fear that you might not revive."

Now there were two other faces smiling beside that of Lotus Grenville the austere, yellow features of the Doctor and the ugly, scarred face which was so dear to him, the face of the blond Vulcan, Geoffrey Von Elmar.

"Lotus tells me that you saved both our lives, Doctor," said Ralph, smiling up at those smiling faces. "Tell me what happened. I don't remember anything after I was swept off my feet by the torrent."

"As your friend, I should be delighted to enlighten you, Mr. Morton," replied the Doctor, "but as your physician I must prefer sleep and rest."

"But I can't rest!" exclaimed Ralph, starting up, only to sink back with a groan of weakness. "Good heavens! We're wasting time when I ought to be working on the iron disease."

"Don't worry, my friend," said the Doctor, soothingly. "Submit yourself to a slight treatment and then perhaps you will feel better and we can talk about these matters."

The Doctor drew down the sheet from Ralph's shoulders and began a process which resembled but faintly the rubbing and pounding which passed for massage in past ages. The long, tapering fingers of the Japanese flew over the skin of his subject, lingering here and there with a light pressure on this or that nerve and blood vessel.

Within a minute or two, Ralph's eyes lost their feverish excitement, then closed and presently his breathing lengthened into the even respirations of natural slumber. The Doctor ceased his manipulations and stood watching the sleeper thoughtfully.

"It will be well that our friend should not worry about anything for a while," he said, turning to the others. "The injured brain must not be submitted to any unnecessary strain. Come, let us see!"

He bent over Ralph once more, his sensitive finger tips seeking some hidden spot at the back of the neck. Presently he straightened up with a nod of satisfaction.

"There! That is well," he said. "Now he will rest. You, Mr. Von Elmar, shall watch with our friend by night. You, Lotus San, shall watch by day. And I, the little doctor who begins to love you all, will watch both day and night. With such care, our brave friend will be well in a week. Then we will work!"

WHEN Ralph awakened, it was with a total absence of pain and worry. Somewhat to Geoffrey's surprise, he seemed content to lie and watch the clouds drifting above the mountains or to talk quietly with his friends. There was no further mention of the great problem which had caused him so much agitation upon his first return to consciousness. The hours just drifted by in unruffled calm, utterly foreign to Ralph's usually dynamic temperament.

When Lotus Grenville brought him his meals or came to her place at his side, the placid happiness of his expression was accentuated and his eyes never left her face until Geoffrey came to relieve her. From the first it was obvious to Geoffrey and the Doctor that there was a deep understanding growing up between these two, one of those comradeships based upon sane affection and perfect mutual understanding which were so common between men and women in that happy age.

The week of convalescence, which Dr. Umetaro had prescribed, drew to a close and one morning he came to Ralph's bedside with Lotus, just as Geoffrey was about to relinquish his watch.

"How is our patient feeling today?" he greeted smilingly.

"Splendid, thank you, Doctor," Ralph replied cheerfully, "But I shall be jolly glad when I can dispense with these bandages."

"Then you shall be 'jolly glad' in a few minutes, my friend," said the Doctor. "I think that I have a surprise in store for you."

"A surprise?" puzzled Ralph. "What is that?"

"About these bandages of which you speak. May I ask how you sustained the injury to your head which made the bandages necessary."

Lotus and Geoffrey looked up at the Japanese scientist in astonishment. Was it possible that he suspected Ralph of a serious injury to the brain; an injury which might involve permanent loss of memory? Ralph, however, expressed no surprise, either in expression or voice.

"Of course I can't tell you that," he said calmly. "I have only been here for a week!"

"Just what do you mean by 'here'?" queried the doctor.

"In this life, of course," was Ralph's amazing reply.

Lotus opened her lips to speak, but the Doctor stopped her with a smile and a gesture.

"You have no recollection of any life before this in which you find yourself, Mr. Morton?" he asked.

"Certainly not!" Ralph answered with a renewal of that puzzled expression. "Why should I?"

"You are right. Why should you, indeed?" said the doctor, his smile broadening into something very like exultation. "And now I will remove your bandages."

A few snips of the scissors and the white gauze fell away. When they were loose, the doctor removed a small, curiously shaped object from the back of Ralph's neck, where it had been held by the pressure of the wrappings. Gently but firmly the scientist massaged the flesh where this object had rested and then, holding out his hand, assisted his patient to rise.

Ralph sat on the edge of the sleeping couch, an expression of utter bewilderment on his face. He looked from one to another until his gaze came to rest on the girl, lingering there for a dozen seconds. Then he passed his hand uncertainly across his brow.

"Lotus—Lotus—I don't understand—what has happened," he stammered brokenly.

In a moment she was beside him, her arm around his shoulder, her cheek against his.

"It's all right, Ralph. I'm here. It's all right!" she crooned, and then, with a flash of fiery indignation to the still smiling doctor. "What have you done. Oh! What have you done to him?"

"Do not be alarmed, Lotus San," said the Japanese, reassuringly. "Our friend will soon find himself. Doubtless it is a shock to find that he was more than a week old."

Ralph raised his head with a little smile trembling on his lips.

"It was a bit of shock, Doctor," he said, "but it's all coming back now. The last thing I remember is your saying, 'Then we will work!'"

"I owe you a little explanation, my friends," said the doctor. "It has long been recognized that in many cases of injury, particularly those which affect the brain, recovery is much retarded by the tendency of the mind to dwell upon previous events, or, as we should say, to worry. For many years the medical section of the Rebels has devoted much study to this problem, especially along the lines of discovering a harmless anæsthetic by means of which the patient could be kept unconscious until he was completely recovered.

"We had worked and experimented for nearly fifty years when, almost by accident, I found that by superficial pressure upon certain nerves-centres it was possible to temporarily destroy the function of memory without any injury to the patient and without the slightest unpleasant after effects. I have only recently perfected the technique of this treatment and our friend here is the first case in which it has been practically applied. You can understand, therefore, my gratification at the entire success of my method. With the brain completely free from all worry about the future and undisturbed by any memory of the terrible experiences through which he had passed, Mr. Morton has recovered from his injury in a mere fraction of the time which would ordinarily be necessary."

That evening Ralph found an opportunity to ask Geoffrey a question which had been hovering in his mind ever since he had recovered the full sense of his faculties.

"Tell me something, Geoff," he said. "I notice that you and Dr. Umetaro talk quite freely before Lotus, of our scientific work. Is it possible that she, too, is one of these Rebels?"

"Not at all, old man," replied his friend. "In fact she has every reason to feel a strong antagonism to our aims; stronger reasons than anyone in the world, except perhaps one other. But she has other reasons which incline her to regard our investigations in a favorable light and I think I may say that the latter reasons far outbalance the former!"

"Don't be mysterious, Geoff!" exclaimed Ralph, "What are these reasons and who is she that she should be so antagonistic to us?"

"Those are questions which you had better ask her yourself!" Geoffrey answered, his ugly face wrinkling into smiles.

Ralph relapsed into thoughtful silence for a few moments and then changed the subject.

"Tell me how we ever came out from under the glacier alive," he said. "I take it for granted that you or the Doctor found us."

"It was the Doctor," Geoffrey answered. "You remember that when you started for the head of the glacier and I left for a flight to Aklavik, he decided to sit on the balcony and meditate. He seems to have tired of that and decided to walk down to the tongue of the glacier and examine the ice cave from which the river flows.

"While he was standing there, he saw something blue flash by in the torrent. Without the slightest idea of what it might be, he ran down stream after it until he came to that shallow—you know the place, Ralph. Well, he waded in and dragged you both to the bank. Then he started to work on you. Honestly, that man is a marvel! I should have given you up for drowned, for neither of you were breathing. He worked over you for nearly two hours.

"Lotus was the first to recover, for she had suffered no bodily injury, thanks to your protection. You seem to have rammed your head against a rock and the best he could do was to get your lungs working. When he was satisfied that you were out of danger, he built a big 'smudge' to attract my attention when I returned from the north. Of course, he couldn't leave either of you, and he couldn't carry you both. Well, I saw the smudge and I guess that's all."

IT was only after considerable effort that Ralph succeeded in worming out of his friend the account of his own share in the rescue; how he had been obliged to land his plane on the flat ice a mile above the glacier tongue; how he had picked Ralph up in his mighty arms like a baby and carried him over boulders and crevasses to the plane and then hurried back to relieve the Doctor, who was following more slowly with Lotus. And finally how the two of them had watched over him day and night, for nearly seventy hours, forgetting sleep and even food until Lotus, refusing to stay on her couch, brought them something and relieved them beside the unconscious man, who, as though in response to the call of her presence, regained his senses almost immediately.

The three friends plunged into their work with renewed energy while Lotus established herself in the rôle of housekeeper, it being taken for granted that she would not return to her lonely cabin on the meadows beyond the snow pass. A week elapsed before Ralph found the chance to ask her the questions which Geoffrey had declined to answer.

Geoffrey and the Doctor had gone to Winnipeg to obtain supplies and did not return until late. After dinner, the other two were sitting on the balcony when Ralph broached the subject.

"You are interested in what we are trying to do, are you not, Lotus?" he said.

"Yes, very much," she answered, simply.

"And you sympathize?" he asked.

"More than I can tell you, Ralph."

"That seems strange when the world is against us. Geoff tells me that there is some special reason why you should be bitterly opposed to our investigations and another reason why you favor them. He was very mysterious about it. Will you explain what he meant?"

"It's nothing very mysterious, Ralph. I am an orphan and I live with my uncle, who is also my guardian. He is Clifford Weatherby."

"Clifford Weatherby—the financier!" Ralph exclaimed.

A great light illuminated his mind. What wonder if the niece of Weatherby, the great Ironmaster, should shrink from the men who were working in opposition to her uncle, who stood to gain untold wealth from the failure of their research!

"I understand, Lotus," he said, at last.

"Oh! But you don't, Ralph," she cried. "My uncle is a throw-back. He seems to have inherited his instincts from some ancestor in the twentieth century. He loves his wealth for the mere joy of possession and for the power it may give him over other men. He hates to see everybody happy and comfortable as they are today. He wants to feel that people owe their happiness and comfort to him, and are his slaves as the poor folk were slaves of the rich in the old, bad days. He rejoiced at the news of this terrible disease which is destroying the iron ore, because he believed that it would restore the power of wealth. He tried to persuade the other ironmasters to join him in a—a monopoly, I think they called it, so that people would have to pay enormous prices for the necessities of life, but they wouldn't hear him."

"Then you don't fall in with your uncle's views?" Ralph asked.

"I hate them!" she cried, her eyes flashing in the starlight. "Oh! Ralph, surely the All Wise would not permit such a horrible thing!"

Ralph's hand reached out and found hers in a clasp of understanding.

"But what about my other question, Lotus?" he said, his voice trembling a little. "Geoff says that you have some special reason for approving of our experiments. What is that?"

"I—I can't tell you," she said, turning towards him to meet his eyes, her own shining like sapphires. "You will have to guess that for yourself, Ralph."

Ralph possessed himself of her other hand.

"Shall I answer my own question by asking you another?" he smiled.

She nodded, not trusting herself to speak.

"Shall we be companions, Lotus? I love you."

"Your question answers your question, Ralph," she said tenderly. "I love you too, my dearest, and I will be your companion for all our lives," and she raised her face to his for their first kiss.

CHAPTER VII.

The Dark Star

AFTER Ralph's recovery, the three men threw themselves into their work with redoubled energy.

A new spirit seemed to permeate the little community with the coming of Lotus Grenville. Failure—and failure was all they had to show for their efforts—no longer brought discouragement. Ralph and Lotus were happy in their new-found love and the joyous prospect of life-long companionship which was to be theirs. Geoffrey was happy in the happiness of his friends, although Ralph, to whom Geoff's emotions were an open book, thought that at times he could detect a certain wistful sadness in the latter's expression as he contemplated the perfect concord which marked the relationship of the lovers.

Dr. Umetaro showed his racial traits by exhibiting little emotion, either of hope or discouragement, assuming with calm fatalism that if they were destined to succeed they *would* succeed, and if not—well, they would fail!

News from the outside world reached them by way of the telenewspapers. Under the direct supervision of John Ballantyne and Hector Shawn of the Three, every scrap of untainted ore was being removed from the mines in frantic haste. Thousands of gigantic freight planes were rushing the ore southward to the Antarctic, to be piled in huge dumps on the eternal ice fields where it would be safe from the ravages of the mysterious disease.

So rapid was the progress of the disease that the total amount of ore saved was pitifully small; barely enough to feed the ferroverters which supplied the world with necessities, for a period of five years. In that short space of time the people would have to remodel their entire economic system and themselves with it. In a world unaccustomed to changes of any sort for two hundred years, and conservative to a degree which would have been unthinkable in the twentieth century, the task of effecting this transformation in so short a time appeared almost hopeless.

True, there was no danger of starvation, but it should be remembered that every age acquires a set of habits determined by its environments, and that anything which disturbs these habits produces an effect out of all proportion to their intrinsic importance. The lack of telephone and electric lights meant nothing to the ancient Romans, who had never been accustomed to these conveniences. On the other hand, a total failure of the lighting and communication systems in the days of President Hoover and King George V. would have meant economic disruption and perhaps anarchy.

It will be easily understood, therefore, with what dismay the Board of Control regarded the destruction of the iron mines, the more so that many of the materials which had been supplanted by transmuted iron, could not be returned to production in less than forty or fifty years, if at all. Wood, for example, had not been used in manufacturing or building for two centuries. With the population spread over the whole habitable world, trees were grown solely for their æsthetic appeal. Except for the high mountain regions, great forests were things of the past.

Combine these facts with the tremendous difficulty of developing machinery for cutting and working lumber, to say nothing of training the workers, and the immensity of the problem can be seen. Multiply this difficulty a hundredfold to cover all the ramifications of the arts which aliotropic iron had supplanted—is it any wonder that the Board of Control shrank from its task of reorganization?

After his recovery, Ralph pored over the filed copies of the New York Tele-Post for some account of Clifford Weatherby. A few days after his dramatic escape from the Ironmasters' Convention, he had gone to Santa Lucia and tendered a public apology to the Three for his defection, and stated that the ore in the mines which he controlled had been entirely destroyed by the disease. The Three banished him for a year to his Florida home and issued a proclamation that no citizen was to hold communication with him during that period. Weatherby accepted the punishment with humility and left Santa Lucia the same day. He had not been heard of since.

Lotus Grenville was much distressed by the news.

"I can't sympathize with my uncle's views," she said to Ralph, "but now that he is in trouble I feel that he needs me. Ought I not go back to him?"

"You cannot do that, dearest, without incurring the displeasure of the Three," Ralph reminded her.

"I have a feeling that there is more in this than appears on the surface," said Geoffrey, musingly. "From what you have said, Lotus, and from what Ralph observed in New York, Clifford Weatherby is not the type of man to submit to correction tamely. It seems hardly possible that the ore in the Florida mines was completely destroyed when uninjured ore remains near the surface everywhere else. I can't help thinking that

Weatherby has some plan up his sleeve. What if he has saved a large quantity of ore and intends to wait until the ore in Antarctica is consumed before putting it on the market?"

"What good would that do him?" Lotus asked.

"Don't you see that your uncle is crazy for power?" explained Geoffrey. "With sole control of the last remnant of ore in his hands, he could sate his appetite for power to the limit."

THIS conversation took place one day on the balcony where the four friends always gathered for an hour's relaxation after luncheon. The Doctor, who had taken no part in the discussion up to this point, came out of a reverie and brought down his clenched fist on the arm of his chair with such unusual violence that the others started.

"Ah! The fools! The blind fools!" he exclaimed. "They have strangled the spirit of Science and now, in their travail, they cry out for help which is not forthcoming! There is iron enough to supply the world for a thousand centuries at our very threshold, and we cannot reach it. Who knows! Perhaps if science had been allowed to continue her progress unfettered in the past, she might be able to provide the means whereby this mine of untold wealth could be tapped?"

"Iron for a thousand centuries?" cried Ralph. "Why Doctor, what can you mean? Where is this mine of wealth?"

"Is it possible that you do not know of the Dark Star?" demanded the Japanese.

"The Dark Star?" repeated Ralph. "Never heard of it."

The others were equally mystified.

"Three persons of more than average education and intelligence," exclaimed the Doctor, "in the Age of Social Enlightenment, who have never heard of the greatest astronomical event in the history of mankind! Know, my friends, that on the eighteenth day of Sol in the year 2123, the Earth acquired a new satellite. A dark sphere, rushing through space, came within the range of the earth's gravitational attraction. Snatched from its orbit by the pull of the superior body, this Dark Star has continued to circle around us ever since and will continue to do so through all Eternity—unless——"

"Unless what, Doctor?" asked Ralph, as the speaker paused.

"Unless the All Wise has decreed another fate for it!"

"Explain! Explain!" cried three voices in chorus.

"You must understand," said the Doctor, "that this Dark Star is a spherical mass about fifty miles in diameter, which is believed to be the remnant or nucleus of some planet belonging to a solar system immensely distant from our own. We can only guess at the nature of the cataclysm which caused the disruption of the original planet. Possibly it was a collision with another body, or more likely, internal strains due to cooling combined with a tidal effect caused by proximity to another sphere.

"Whatever may have been the cause, the heavy central nucleus was hurled out of its parent system into open space. All this occurred thousands or even millions of years ago. The latter estimate is the more probable since the disruption must have been accompanied by a great display of light which would have been visible from the earth. In other words, had the event taken place in historical times, we should have noted the appearance of a 'temporary star' or Nova."

"Have there not been many such Novæ, Doctor?" Geoffrey interrogated. "Why may not the Dark Star be the remains of one of these?"

"It is a possibility, of course," replied the Japanese, "but there is evidence, chiefly spectroscopic, which throws doubt upon the theory. However that may be, the journey of the Dark Star through space ended with its capture by our earth. The event was accompanied by violent storms, tidal waves and earthquakes; the protests of Mother Earth at being forced to adopt the child of another parent. Even in those days, Science had fallen so low that few people made any attempt to trace the source of these catastrophes. The Dark Star became the sister of our Moon; the daughter of a planet bearing upon her bosom nearly two billion human beings, yet of all those teeming myriads, only one man was aware of what had taken place."

"But surely, Doctor, people would have seen the Star," interposed Lotus. "You speak of the Dark Star as a sister to the Moon, but we do not see two moons today."

"You forget," smiled Ralph. "Dr. Umetaro told us that the Dark Star is only fifty miles in diameter. The Moon is over two thousand."

"Your explanation, while plausible, is not the correct one, Mr. Morton," stated the Doctor, "as you will realize when I have told you the elements of the Dark Star's orbit. As I have mentioned, the Star is about fifty miles in diameter. It follows an almost circular path and its mean distance from the surface of the earth is just over four thousand miles. Obeying the universal law of gravitation, it completes a revolution in approximately four hours. It travels, therefore, at a speed of fourteen miles per minute or about four hundred yards per second."

"Forgive me for interrupting you, Doctor," cut in Geoffrey, who had been scribbling on his tablets, "but according to Kepler's law, a satellite having a period of four hours would be eight thousand miles from the earth, not four thousand."

"You forget that so far as the effect of gravitation is concerned, the earth acts as though its entire mass were concentrated at its centre. The Dark Star is eight thousand miles from the centre of the earth and therefore four thousand from the surface."

"Sorry, Doctor!" apologized Geoffrey. "I ought to have known that. You were about to tell us why the Dark Star is not generally seen."

"First let me point out that its invisibility is not due to its small size. On account of its proximity, the Dark Star, when in the zenith, has an apparent area two and a half times as great as the moon, but, also, on account of its nearness, it appears only half the area of the moon when at the horizon. The reason for this will be obvious if you think that when the star is overhead we are looking radially across its orbit, a distance of four thousand miles, but when it is near the horizon, we look along the hypotenuse of a triangle of which the shorter leg is four thousand miles and the longer leg eight thousand miles. Is that clear?"

THE others nodded and the Doctor continued.

"We see then, that the size of the Star would command immediate attention if it possessed the lustre of the moon. But this is not the case. The Star is actually dark. Its surface possesses some peculiar quality so that, instead of reflecting the sun's rays, it absorbs them like a piece of black ferrovel. Therefore it is invisible."

"Such a body as you describe would be invisible in one sense," commented the practical Geoffrey, "but in another sense it would be very visible indeed. It's a matter of background. The Dark Star would be seen against the background of the sky, just as the black embroidery on the tunic Lotus is wearing, stands out against the background of blue ferrovel."

"Quite so!" agreed the Doctor, nodding. "That is exactly the way the Dark Star is visible in the heavens."

"Well, but Doctor," protested Geoffrey, "surely you don't mean to say that there has been a black hole in the sky, three times the area of the moon, for nearly a hundred years, and that during that time no one has seen it!"

"Yet that is just what I do mean," replied the Japanese, calmly.

"I know!" cried Lotus, excitedly. "The Dark Star is never above the horizon in the daytime. That's why we don't see a black hole in the blue sky!"

"Come, come, Lotus San!" cried the Doctor, his black eyes sparkling with fun. "That bit of logic is hardly worthy of you. Have I not told you that the Dark Star's period of revolution is four hours? Think for a minute. If the moon were dark, should we know of its existence? When the moon is 'new' and turns its dark side towards the earth, is it visible in the daytime? Remember that the blue dome we call the sky is an illusion due to the scattering of the sun's rays as they pass through our atmosphere. In order for a body to appear as a black hole in the blue sky, it must be *in* our atmosphere, not outside it."

It was Geoffrey again whose keenly analytical mind picked out the critical point in the Doctor's dissertation.

"I take it that the Dark Star is visible at night in so far as it hides the constellations over which its passes," he observed.

"You are right, Mr. Von Elmar," replied the Doctor, "only it is hardly accurate to speak of the Dark Star hiding whole constellations. An occasional star here and there amongst those which are visible with the naked eye, is occulted or eclipsed by the passage of our little satellite. The world, having lost all interest in astronomy as a science, looks up to the starry heavens and loves them for their beauty and emotional appeal, but who would notice the periodical absence of one or two stars amongst so many hundreds? Only the scant dozen astronomers who are on the rolls of the Rebels, have gazed through their telescopes and seen the Dark Star in its entirety. It happens also, that the orbit of the Star is almost exactly parallel to the axis of the earth, so that a large part of its path is over the north and south Polar regions, which reduces considerably its chance of being noticed."

Ralph, his imagination and love of the romantic past stirred by the Doctor's description, harked back to something that the Japanese had said.

"And you say that out of all mankind, just one saw the advent of our new satellite?" he wondered.

"The word I used was 'aware,' not 'saw.' I think," corrected the other. "The story of how that humble servant of science watched the coming of the Dark Star is one of the little romances which brighten the tedium of our work. Deep down in a cellar, where, for fear of the criticisms of his neighbors, he had built a little workshop, William Blake was absorbed in studying the magnetic properties of certain alloys of iron and chromium. He had constructed a magnetized needle upon a delicate pivot, similar to the compasses which were used on ships many years ago. The point of the needle hung above a finely divided scale, above which was a microscope for the purpose of observing the slightest movement of the needle due to the proximity of the metal under test.

"Blake had adjusted the scale so that the needle pointed exactly at zero. Just then, his companion, who shared his ambitions of course, called him to luncheon. An hour later he returned to his workshop and applied his eye to the microscope. He was somewhat surprised to find that the needle had moved away from the zero point.

"Supposing that he had made an error, Blake readjusted the scale and turned his attention to preparing a sample of the test metal. When it was ready, he looked through the microscope again before beginning the experiment. To his great astonishment, the needle had moved off the zero point once more. After that the chromium alloy was forgotten. For hours Blake sat, with his eye at the microscope, watching the slow movement of the needle. That infinitely slow, creeping movement was the Dark Star's handwriting; the message of its advent into the sphere of earthly attraction.

"Blake had no idea of the cause of the phenomenon he had discovered. Indeed, it was several years before the true explanation was found. Several Rebel scientists, to whom Blake confided his discovery, combined to watch the movement of the compass needle. They noted that the needle swung in one direction for sixty-one minutes, then slowly returned to normal in sixty-one minutes more. The succeeding two hours was marked by a similar deflection in the opposite direction. Meanwhile an astronomer in the Andes had noted the presence of our new satellite. The mysterious excursions of the compass needle were immediately explained. It was being attracted by the Dark Star as that body swung around in its new orbit."

"Doctor, I'm very ignorant of scientific matters," Lotus said, "but I thought that the compass needle was only deflected by iron."

"Did I not tell you, Lotus San, that a mine of wealth lay at our threshold if we could but reach it? The Dark Star is the central nucleus of a shattered planet. It is a globe of solid iron fifty miles in diameter. Sixty-five thousand cubic miles of iron, weighing in the neighborhood of two million billion tons, poised in the heavens no further away than the distance from Florida to Vancouver. Was I wrong when I said that there was iron enough to feed our ferroverter for a thousand centuries lying on our very doorstep?"

There was a long silence when Dr. Umetaro concluded his explanation; not the respectful silence of an audience at the end of a lecture, but the tense, stifled pause which follows a tremendous and unexpected explosion. The conception of that globe of iron pursuing its unchanging course around the earth was too astounding to be grasped in a moment. Iron was the backbone of civilization in the Age of Social Enlightenment. A strange disease had sapped the life of that backbone, leaving civilization supine and helpless. There, in space at the threshold of the world, as the Doctor had said, was a new backbone, all ready for use and yet unreachable.

GEOFFREY and Lotus broke silence simultaneously. The narrow space which separated the earth from her new satellite *must* be bridged. The Dark Star must be reached by space fliers, and colonies established upon its surface to mine this boundless wealth. The Rebels must drop their attempts to cure the disease which was destroying the terrestrial mines and concentrate upon the task of designing the fliers which would open up this new source of supply.

These and a dozen other impracticable suggestions came crowding one another in breathless excitement from Lotus and Geoffrey. Dr. Umetaro waited until they had finished, smiling tolerantly, with the expression of one who listens to the babbling of children.

"Is that all, my friends?" he asked, quizzically. "Then I fear that I must crush your glowing hopes to earth. The Dark Star is as inaccessible to us as though it were still reposing in the womb of its parent planet,

billions of miles away. Let us admit that we can invent and build the necessary space fliers, of which I am very doubtful. How do you propose to establish colonies and carry on mining operations upon the surface of a body where gravity is less than a millionth as great as upon the earth? Place the average man upon out tiny satellite and he would weigh about one-fiftieth of a grain. Even you, Mr. Von Elmar, would have difficulty in maintaining your footing and handling a Vrilol Drill with a body weighing less than one of Lotus San's hairs!

"Another thing," continued the Doctor. "The Dark Star possesses no atmosphere. I will forestall your protest that it would be an easy matter to make our own air or carry it with us, by reminding you that the earth's atmosphere has a secondary function almost as important as that of maintaining oxygen in the blood. It is a shield and buttress against the artillery of heaven. But for the kindly protection of our comparatively dense atmosphere, few if any of us would live out our days, for we should succumb to the bombardment of myriads of meteorites which are now consumed by the friction of the air and become dust, long before they can reach our devoted heads!

"Upon the Dark Star, however, we should have no such protection and even if all other difficulties were overcome, the settlements you propose would necessarily be attended by enormous loss of life. Mining iron on the Dark Star would be like cultivating a piece of land while a hundred machine guns such as we read of in the last great war, sprayed a hail of death across the fields! Am I not right, Mr. Morton?" concluded the Doctor, turning to Ralph.

It was not until then that the others realized that Ralph had taken no part whatever in the burst of excited comment which had greeted Dr. Umetaro's account of the Dark Star. In fact, he seemed to have been paying little or no attention to the conversation. He lay back in his chair, idly fingering the fringe of his tunic, as though the discussion were something in which he had not the remotest interest.

In spite of the vacancy of Ralph's expression, Geoffrey seemed to sense a keen alertness in the other's eyes, as if his attention, instead of being given to the subject in hand, were concentrated upon something of which the rest were not aware. His reply to the Doctor's query confirmed Geoffrey in his impression.

"Yes, certainly, Doctor!" Ralph exclaimed. "I quite agree with you. It is time we returned to the workshop."

"Why, Ralph!" cried Lotus, in mock indignation. "I don't believe you have heard a word of what we have been talking about!"

"I'm afraid I have been thinking about something else, my Flower," rejoined Ralph, rising and allowing his hand to linger tenderly on the golden head. "Come, let us get to work."

CHAPTER VIII

Clifford Weatherby Shows His Teeth

GEOFFREY was not surprised when, a little while after the conversation which had been recounted, Ralph found an excuse to call him into the study and, having closed the door, motioned him to be seated.

"You must have thought me very discourteous, Geoff," he said, "to be day-dreaming while the Doctor was giving his little lecture on the Dark Star. The fact is that I got to thinking about Clifford Weatherby, and your remark that he was not the type of a man to submit to punishment tamely. A man like Weatherby would stop at nothing to accomplish his aims. It is even possible that he knows a lot more about the Rebels than we imagine. He would conceal any knowledge he may possess because it is his nature to be secretive, and also because he would foresee the likelihood of using the accumulated learning of the Rebels to aid him in his bid for power."

Geoffrey looked at his friend in unconcealed doubt.

"I can hardly see your reasoning, Ralph," he said. "Weatherby is just one man, after all; a man who is at present in banishment and under the displeasure of the Three. What can he hope to do?"

"We can't know what assistance he may have, Geoff," Ralph exclaimed, beginning to pace the floor. "It takes more than two centuries to change the nature of the human race. There will be throw-backs, as Lotus calls them, for many more generations; men and women whose minds and methods of thinking will hark back to past ages. A band of such Atavars, under the leadership of an unscrupulous man like Weatherby, might do untold harm before they could be got under control. Who knows but what he is aware of even *our* small activities and is planning to destroy us at this very moment?"

"Really, old fellow, I think that you're allowing your imagination to run away with you?" Geoffrey laughed. "This valley is the most isolated spot on the North American continent. Why, we've never seen a single human being except Lotus, in all the years we have been here."

"If that is true, Geoffrey," said his friend, slowly, "will you tell me why I watched a man signalling by means of a mirror, during the whole time we were sitting on the balcony?"

"A man! Where?" exclaimed Geoffrey, starting to his feet.

"At the top of the cliffs on the opposite side of the valley," replied his friend, calmly.

Geoffrey was dumfounded. He and Ralph had, of course, realized that by engaging in scientific research work they were laying themselves open to severe censure not alone by the Three, who, after all, were only the chosen representatives of the people, but by the whole human race. Geoffrey understood this perfectly, but he felt so secure in the isolation of the aerial workshop that it never entered his mind that anyone would visit them with evil intentions.

"Are you quite sure, Ralph?" he asked, at last. "Might not the signals you saw have been sunlight reflected from a quartz crystal or a piece of mica?"

"I thought of that explanation," replied his friend, "but I am quite confident that the flashes were caused by human agency. It is true that they did not conform to any code with which I am familiar, but they were unquestionably signals of some sort."

"But to whom would he be signalling?"

"Presumably to some person on the mountain side above us. Geoffrey, I tell you that I have a feeling which amounts almost to certainty, that Clifford Weatherby knows of our work. Don't ask me what makes me so sure of this, for I can't tell you."

Geoffrey spoke hesitatingly with his eyes turned away:

"Could—could it possibly be——"

"Be careful, Geoff!" snapped Ralph, his eyes flashing dangerously. "Do not say anything you may be sorry for."

"Beg pardon, old man," rejoined Geoffrey, frankly. "I spoke without thinking. But what about the Doctor. After all, we only have his word for this story about the Rebels. What if he is a spy of Weatherby's! I hate to think such a thing is possible, but we must consider every possibility."

"You can bar Dr. Umetaro," said Ralph confidently.

"If he were an agent of Weatherby's, he would have let me drown when he saw me in the river and then dealt with you at his leisure. Instead of which, he saved my life. No, I can swear the Doctor is as true as ferrolith."

"Then what other suggestion can you make?" asked Geoffrey.

"None," answered Ralph. "But I can tell you one thing, Geoff. I'm going over to the other side of the valley tonight and find out what caused those signals."

"Let me go, Ralph," begged the other. "I'm a bigger man than you, and if there is going to be any trouble, I can probably take care of it all right. In any case, you are far more important to this enterprise than I. If I don't come back, you three can skip out and find another place to work."

"You could do no good by going," his friend said with finality. "You didn't see the flashes and it's too dark for me to point out the place. Even if I could, you would never get up the cliffs. You're a Hercules of strength, Geoff, but you are about as much use on a bit of rock climbing as an elephant, if you'll forgive my saying so!"

"Then let me come with you," Geoffrey insisted. "With a rope——"

"I'll go by myself!" Ralph stated emphatically. "I know those cliffs by heart. I can get up there without making a sound and come back without being seen."

Geoffrey knew his friend too well to attempt any further persuasion, but it was with a heavy heart that he saw his friend drop over the edge of the balcony at midnight and disappear in the gloom. Lotus and the Doctor were sleeping and knew nothing of the proposed expedition.

"Don't worry, old man," were Ralph's last words. "I shall come back all right. If I don't——"

The rest of his thought was unspoken, but Geoffrey understood and accepted the trust.

In half an hour Ralph set foot on the ice. The sheer cliffs below the workshop had presented no more difficulty in the darkness than they would have done in broad day. Every familiar support and hold fell into place beneath his feet and hands, as though he were an automaton.

The crossing of the glacier was not so simple. He knew, of course, the general location of the crevasses and had no particular wish to renew his acquaintance with the icy depths which had so nearly proved his death two weeks before. Slowly and cautiously he felt his way, probing every step ahead with his ice-axe. Once, in crossing a snow-bridge, a leg plunged through to the hip, but he saved himself by falling forward and crawling across on his face.

AT LAST, with a sigh of relief, he saw the cliffs of the farther side loom up through the blackness and in a few moments his hands touched rock.

A brief inspection told him that he had steered his course well. He stood at the bottom of a narrow ridge which projected from the otherwise sheer face. By daylight he might have made his way up the cliffs at any one of a dozen places, but in the darkness his only hope was to follow the ridge. It was tremendously steep, but it constituted a guiding line from which he could hardly deviate, like the thread by which Theseus made his escape from the den of the Minotaur.

Ralph slipped off the heavily nailed sandals in which he had made the crossing of the slippery ice and started up the rock in his naked feet. This he could do with confidence and safety, for continual contact with the mountains had hardened the soles to a degree which was unusual, even in those days when men and women of all ages went barefoot as much as conditions would permit.

His progress up the ridge was almost as rapid as the descent of the cliff below the workshop. He could not possibly mistake his route, with the edge of the ridge to guide him. Once or twice the rocks shot up vertically for a hundred feet, but always there were good holds by which he overcame the difficulty.

At last he felt the angle decreasing and in an hour from the time he had left the glacier, he stood on the rim of the cliff, two thousand feet above it.

What next? For a moment the thought flashed through his mind that the most sensible thing to do was to return the way he had come and go to bed! Perhaps Geoffrey was right and the idea of some malignant personality crouching on the cliffs was just a figment of the imagination. After all, what justification had he for believing anything of the sort? A flickering light which might be signals but was probably the reflection of the sun on the facets of a rock crystal. He felt a natural antagonism to Clifford Weatherby, who might, for all his strange views, be a very estimable old man. On these impressions, hazy and indefinite at the best, his mind had built up a structure which would probably prove to be utterly without foundation. Mankind had not yet reached the stage of universal brotherly love which the religionists of the twentieth century had anticipated, but the whole idea of personal violence, as a means of redressing wrongs, had become foreign to man's thoughts with the coming of the Age of Social Enlightenment.

It was little wonder that Ralph almost turned back from what, he was convinced, would prove a wild goose chase!

In spite of all these very rational arguments, turning back was one thing Ralph had no intention of doing. He would return to the workshop when he had found the cause of those flashes—not before.

THAT afternoon he had carefully noted the spot at which the supposed signals originated, so now he turned to the right and began to work his way eastward along the rim of the cliffs. A dense forest of spruce covered the slopes above him, the trees extending to the extreme edge. The ground was carpeted with soft moss, on which his bare feet made no sound. Here and there, tiny streams from the melting snow-fields far above, trickled through the moss and cascaded into space.

As he crept with infinite caution from tree to tree, his lips curled into a smile of self-ridicule at the thought that he was playing a child's game; was practicing the long forgotten art of scouting, of stealing unheard upon an unsuspecting enemy.

He had progressed in this way a distance of about a mile when his outstretched hand came into contact with cold metal! The shock of finding that his game was likely to prove reality was so sudden that he almost gave voice to an exclamation. Fortunately he was able to control the impulse. Dropping to his knees, he began to explore by the sense of touch, the object he had encountered.

It was a tapering metal tube, five feet long and varying from one to six inches in diameter. The ends were closed by curved, polished discs and the whole thing was mounted on a light metal tripod. A telescope! Instantly he realized the cause of the signals. Someone had been watching the workshop through this telescope. The glitter of the sunlight upon the object glass, which might have escaped notice had it been motionless, was broken up into irregular flashes by the involuntary tremor of the watcher's head; a vibration which was communicated to the eyepiece.

The signals were explained, but what of the motive? In vain Ralph puzzled his brain. Certainly the secret spy could not be an agent of the Board of Control. It was not the custom of the Three to spy upon the people.

If Hector Shawn had reason to believe that there were men carrying on the forbidden practice of scientific research, he or one of the others would have come to them openly and have reasoned with them. If reasoning proved to be of no avail, punishment would be swift and sure, "for the good of the Race."

No, the only answer to the problem was Clifford Weatherby. He alone had anything to gain by secrecy.

Ralph's eyes had to some extent grown accustomed to the darkness. Beside the tripod he could make out the shape of what appeared to be a small square box, resting on the ground. Closer inspection revealed the dials and Radiferr rods of a portable radio transmitter. The spy was not alone, then! He was in communication with some person at a distance, someone to whom he sent reports of what he observed.

Ralph stretched out his hand to submit the radio transmitter to a closer examination, but he never reached it. His keen ears detected a movement behind him. Before he could straighten up, a band of steel seemed to encircle his neck and another band was flung around his body, binding his arms to his sides.

Slowly but surely his unseen assailant was choking the breath from his lungs, and at the same time, dragging him towards the rim. Again and again he flung every ounce of the strength of his splendid muscles into the effort to break the grip of those crushing bands. His bare feet clutched and writhed in the frantic hope of finding some grip in the yielding moss.

Now his horror-stricken eyes could look down into the gulf. The moon, in its last quarter, was beginning to rise above the cliffs. By its faint light he could see the silver ribbon of the glacier, thousands of feet below. So far away it seemed and yet he knew that before his heart could beat a score of times, he would be lying on that silver ribbon crushed into a nauseating, shapeless mass.

He was aware of a low humming sound. It was like a Vrilol motor, but he knew, of course, that it was the roar of the blood in his ears. The crushing pressure of the mighty arms slackened, the resistless urge towards the abyss ceased, but he no longer possessed either the strength or the will to make another bid for freedom. This was the end. A moment more and he would be snatched up and flung headlong into space.

Suddenly, so suddenly that in falling he almost rolled over the edge of the cliffs, Ralph was released. He turned to see a squat, dark form bounding like an antelope up the slope. In a moment it had disappeared. Then, from the same direction, came a shrill cry of fear, followed by a stifled groan of agony and a sound as of some heavy body crashing through the underbrush. Before Ralph could gather up his shaken nerves or formulate any plan to cope with this new enemy, a tall figure came striding through the trees and Geoffrey Von Elmar stood before him. His mighty arms were raised above his head. In one hand he held the ankle, in the other, the hair of a struggling negro, who beat upon Geoffrey's head and face with his clenched fists.

"Here's your little playmate, Ralph," said Geoffrey, paying no more attention to the rain of blows than if they had been snowflakes: "Shall I throw him over?"

"Geoff!" stammered Ralph. "What are you doing here? How did you find me?"

"Followed you in the plane," his friend replied. "It's a wonder you didn't hear the motor. Got an awful shock when you stuck your leg into the crevasse. I thought you were a goner! Keep still, you beast!" he growled to the negro, shaking him as a Great Dane might shake a toy spaniel.

"You were just in time, Geoff," said Ralph. "Another ten seconds and I shouldn't have been here. But how could you follow me in the darkness?"

"Remember that infra-red ray outfit we rigged up last year? I fixed that in the floor of the plane this evening. It was as good as a searchlight. I could watch you all the time while the rays would, of course, be invisible to anyone not having the proper viewing screen. Sorry I didn't get here sooner, but I couldn't find a landing place. Now then, I'll get rid of this brute and we'll go home." The giant took a step towards the edge of the cliff, while the negro burst out into shrieks and prayers for mercy.

"Stop, Geoff!" interposed Ralph. "This fellow may be useful. If you throw him over the cliff, we shall be as much in the dark as ever. Bring him to the workshop and we'll question him. Don't forget, he's only a tool in the hands of others."

"All right, Ralph. Have it your own way, though I hate to forego the pleasure of seeing this insect turning head over heels in the air." And Geoffrey, who would not have dreamed of treading upon an ant intentionally, made a motion with his arms which brought forth a new burst of screams from the helpless negro.

THEY made their way to the plane, Ralph leading the way with a torch, there being no longer any need for concealment. They tied the negro hand and foot with a fibroferr climbing rope and dumped him unceremoniously into the back seat.

Geoffrey started the motor and they soared out over the glacier. Dropping straight down to the foot of the ridge, they retrieved Ralph's sandals and tunic. Five minutes later the plane dropped softly into its cradle at the workshop.

"One sound from you, you pup, and I'll drop you over the balcony!" threatened Geoffrey as he lifted the bound figure out of the back seat. "There's no use of alarming the others, Ralph," he explained. "We'll take this specimen into the laboratory and analyze it at our leisure."

Ralph tiptoed up to the roof. Lotus and the Doctor lay peacefully on their sleeping couches, locked in the profound sleep of early dawn and all unconscious of the exciting events which had transpired. When Ralph returned to the Laboratory, Geoffrey had turned on the light in the ferrolith walls and had released their prisoner, who sat hunched up in a chair, glowering at his captors.

"You see what you can get out of him, Ralph," suggested Geoffrey. "If he doesn't see fit to answer politely, there's always the balcony. I'll tell you! What do you say if I drop him over and you follow him down in the plane? You can catch him before he hits the bottom. Maybe the sensation of a thousand foot fall will open his ugly mouth for him."

Ralph, who could hardly suppress a smile at Geoffrey's assumed rôle, turned to the negro.

"Now then, my friend, let us hear what you have to say for yourself," he said.

There was no reply. The negro did not even deign to look at the speaker, but kept his eyes fixed upon Geoffrey in an unwavering stare.

"You won't gain anything by sulking," Ralph went on, firmly. "Tell us who you are and what you mean by spying on us."

Still there was no reply and the negro continued to regard Geoffrey unflinchingly.

"It looks as if he can't or won't talk, Geoff. What shall we do?"

To his surprise, Geoffrey did not answer. When Ralph looked around, he was amazed to see his friend sitting bolt upright in his chair, his eyes closed and his face as expressionless as a statue.

"Here, Geoff!" exclaimed Ralph in alarm. "What's the matter, old man?"

The negro broke his silence for the first time.

"I am afraid your friend is slightly indisposed after his strenuous exertions," he said, in smooth, cultivated accents.

Ralph flashed an inquiring glance at the speaker. The negro's black eyes were fixed upon him in the same unblinking stare with which he had been regarding Geoffrey. There was something repellant in the chill malignity of that gaze which caused a shiver of disgust and fear to traverse Ralph's spine. He tried to turn his own eyes away and found, to his horror, that he was powerless to do so. He tried to speak and could not so much as open his lips. The paralysis which rendered his body helpless was spreading to his brain. He felt his senses leaving him, all except the sense of sight, which was bound up in those unnatural eyes with their ghastly white rims. Just as consciousness was departing, he heard a voice.

"Listen to me, both of you, and learn who and what I am. I, Kana, of the Rhodesian Division, have mastered your puny minds as easily as that mountain of muscle mastered my body. You wonder why I watched you, though how you discovered that I did so I cannot guess. You wish to know who it is I serve and what I hope to gain by spying upon you. All these things you shall learn, for you will not live to transmit your knowledge to any other.

"Learn then, that I serve Clifford Weatherby, he whom we, his willing servants, call The Master. When the iron disease first threatened destruction of the mines, one of us discovered an antidote. We cannot restore the iron which has been destroyed, but we stopped the ravages of the disease in the Master's mines at the very outset.

"The Board of Control is removing all the untainted ore to the icefields in the south, little thinking that in every load of ore which the planes carry to the Antarctic, goes a piece of diseased ore, placed there by the Master's secret agents. In a year the hoarded ore will turn to corruption on the ice. Then the Master, with sole ownership of every ton of iron existing in the world, will dispose of the Three and rule in their place. Emperor of the Earth by the supreme right of wealth.

"The Master has suspected you two of heresy ever since you disappeared from your homes ten years ago. I filled the place of Secretary to John Ballantyne and gained his confidence. This was before the unexpected advent of the iron disease, which brought success within our grasp. After the Ironmasters' Convention and the Master's banishment by the Three, we knew that nothing could stand in the way of our plans save only the possibility of some meddler and heretic finding a means of reconverting the gold sulphide into iron.

"The Master set me, Kana, the task of seeking you out, of sapping your knowledge, and then, of destroying you utterly. You asked what I hoped to gain by spying upon you from the cliffs. Does it surprise you to learn that I know all about your worthless experiments, all about your wild dreams of mining the Dark Star? Fools! Kana was born without hearing. From earliest childhood I have studied the lips until now I can read them as easily as I can read a printed page. Day by day I have watched your conferences on the balcony, transmitting everything of importance to the Master.

"And now I will make an end of you and your petty schemes!"

He turned to the well-stocked shelves of the Laboratory and selected therefrom a bottle. Filling two glasses with water he added a few drops of liquid from the bottle to each. Then he drew a small table between the motionless figures of the two men and placed the glasses within their reach.

"I am of a sensitive disposition and dislike to watch suffering," he said, his lips drawn up in a snarl of hate. "I am leaving you, taking the excellent plane in which you brought me here. It is now past eleven. When the clock above the door strikes the half hour, you will awake and drink to the health of the Master in this excellent strychnine with which you have so kindly provided me. I have chosen this particular drug because it will give you the keenest enjoyment during its operation.

"Now may I thank you for your kind hospitality and wish you a most pleasant journey to wherever you may be going!"

The grinning negro turned upon his heel. His hand was outstretched to open the door beneath the fatal timepiece, when the door swung open noiselessly.

Framed in the opening stood the Japanese scientist.

Kana spoke no word, gave no start or gesture which betrayed any sign of emotion. He simply stood and fixed the doctor with that baleful stare. The two young men, fully conscious but helpless to intervene, could only sit and watch the unfortunate Japanese succumb to the fatal influence.

To Ralph's amazement, Dr. Umetaro displayed no symptoms of hypnotic sleep. He stood in the doorway, looking at Kana with a benign smile, as though he were welcoming a dear friend, for whom he was slightly sorry. Then he began to advance into the room with slow steps. For every step that the Doctor advanced, Kana retreated a pace until he backed past the two seated figures and stood against the wall.

Ralph could see that Kana's face was utterly transformed. The glare of animal malignity had departed, leaving an expression of peace. The thick lips, no longer drawn back from the teeth in the cruel grin of a satyr, wore the natural smile of a contented child.

The Doctor pushed a light couch to the wall where Kana stood motionless.

"Lie down, my friend," said the Japanese, in the tone of a mother soothing a fractious child. "Lie down and sleep."

Kana stretched his long arms with a gesture of weariness and extended himself upon the couch. His eyes closed and he relapsed into what was apparently a deep natural slumber.

CHAPTER IX

The Claverly Operation

THAT day, work was forgotten. The dramatic suddenness with which their idyllic peace had been broken, drove everything from their minds save the one thought of how they could cope with the problem which confronted them—the problem of Clifford Weatherby's enmity and its bearing on their hopes and ambitions.

In a few moments after Kana had been transformed from a ravening beast into a sleeping child by the power of Dr. Umetaro's will, the Japanese had aroused Ralph and Geoffrey from their condition of hypnotic paralysis. Released from the unholy spell which bound him, Ralph's first thought was of Lotus and he turned to behold her standing in the doorway. Her eyes, still dewy with sleep, mirrored in their violet depths the amazement and concern she felt at the strange scene.

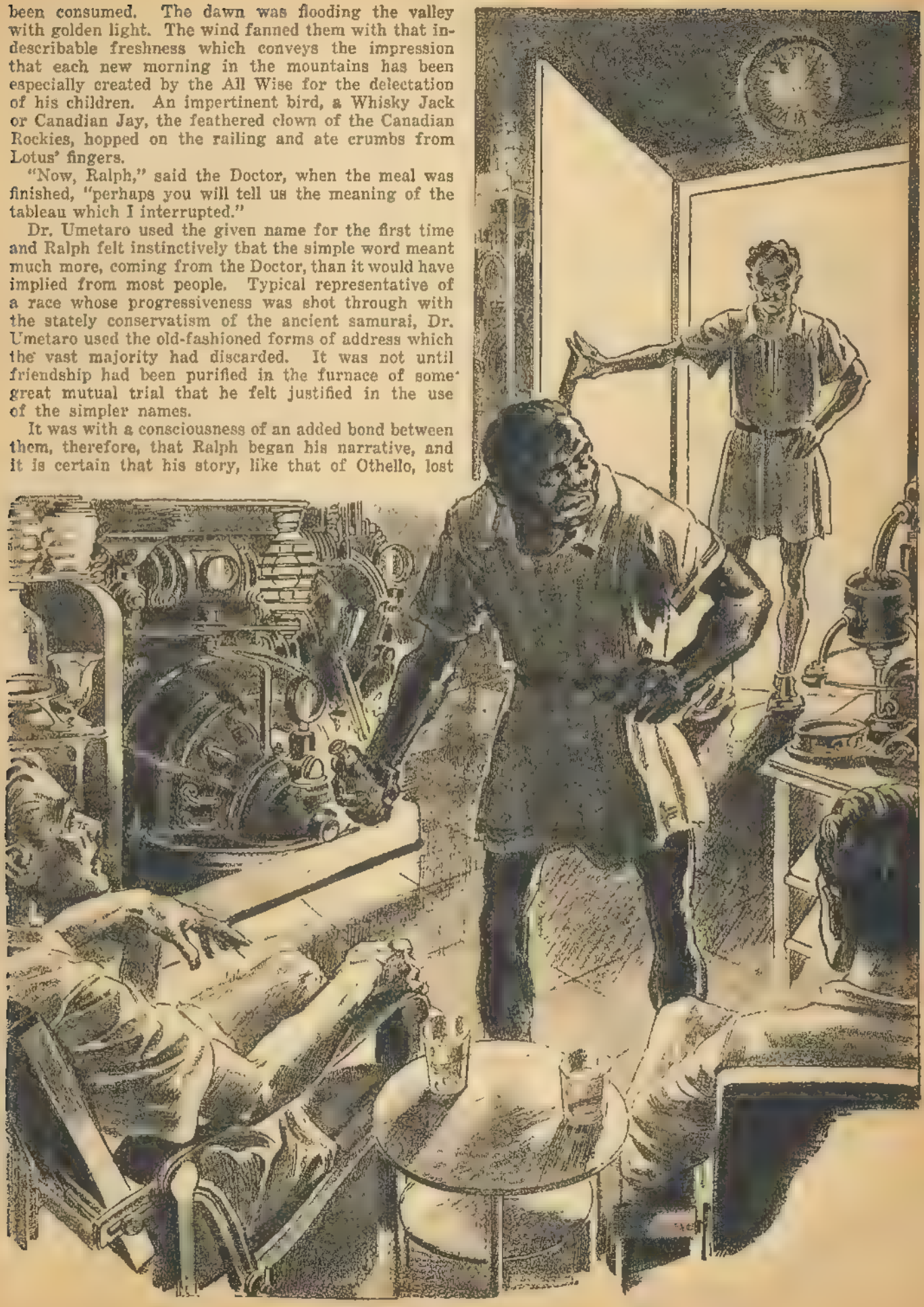
Explanations were in order. The four friends adjourned to the balcony, leaving the negro wrapped in unconsciousness which would last unbroken until the Doctor awakened him. By tacit mutual agreement nothing was said with regard to the events of the night, until their breakfast of fruit and ghilna biscuits had

been consumed. The dawn was flooding the valley with golden light. The wind fanned them with that indescribable freshness which conveys the impression that each new morning in the mountains has been especially created by the All Wise for the delectation of his children. An impertinent bird, a Whisky Jack or Canadian Jay, the feathered clown of the Canadian Rockies, hopped on the railing and ate crumbs from Lotus' fingers.

"Now, Ralph," said the Doctor, when the meal was finished, "perhaps you will tell us the meaning of the tableau which I interrupted."

Dr. Umetaro used the given name for the first time and Ralph felt instinctively that the simple word meant much more, coming from the Doctor, than it would have implied from most people. Typical representative of a race whose progressiveness was shot through with the stately conservatism of the ancient samurai, Dr. Umetaro used the old-fashioned forms of address which the vast majority had discarded. It was not until friendship had been purified in the furnace of some great mutual trial that he felt justified in the use of the simpler names.

It was with a consciousness of an added bond between them, therefore, that Ralph began his narrative, and it is certain that his story, like that of Othello, lost



There, framed in the opening, stood the Japanese scientist.

nothing from the sympathy and absorbed interest of his Desdemona. When Ralph ceased speaking, Geoffrey recounted his share in the night's adventures.

"Now, Doctor, it is your turn," said Lotus. "By what miracle did you appear upon the scene just in time? I want to know—though I think I can guess!"

"Yes, I think you can guess, Lotus San," smiled the Doctor. "You understand, of course, that Kana, who is a negro, apparently from some part of Central Africa, is an adept at the use of hypnotism, an art which has been almost forgotten, except among certain races, from which all the advantages of civilization have not completely purged the ancient evil.

"It chances that I too have studied this art, not that I might use it as Kana did, to work harm upon my brothers, but because it was the key to certain discoveries in the science of surgical anaesthesia. It may surprise you to know that hypnotism is not solely a matter of suggestion, as savants of the twentieth century believed. The superstitions of those past times had a basis in fact. It is indeed possible for a human being, by long years of devoted study, to learn to control the actions of a weaker mind from a distance, but woe betide such an adept who attempts to use his learning to injure others!

"This higher form of hypnosis being, as I have said, a mental process, it is impossible for one adept to practice it without the mind waves impinging upon the sensitive consciousness of any other adept in the vicinity. This being the case, when Kana began to concentrate his mental force upon you two young men, I was instantly awakened. At first I did not recognize the cause of my cerebral disturbance. It was not until I heard Kana's voice raised in the words 'Now I will make an end of you!' that I realized your peril and hastened to your assistance."

"This makes twice that I owe my life to you, Doctor," said Ralph, with emotion. "How can I ever repay you?"

"Or I?" Geoffrey interjected. "It turns my blood cold to think what would have happened if you had been unable to overcome Kana's will."

"Such a contingency was impossible, my dear Geoffrey," said the Doctor, confidently. "Whatever may be the case in the physical world, God always masters Evil in the mental world. This is not merely a pretty phrase; a platitude culled from some religious volume of the past. It is a cold, demonstratable scientific fact, though not stated in a very scientific fashion. It would be more correct to say that strength is good, weakness is evil."

"What did you mean by saying that you thought you could guess the cause of the Doctor's awakening?" Ralph asked, turning to Lotus. Before the girl could reply, the Doctor interposed.

"Is she not your chosen companion, my friend?" he asked softly. "If a mother awakens at the slightest movement of her baby, shall not a woman be aware when her chosen mate is in peril? In the interval between my awakening and the sound of Kana's voice, I heard Lotus San tossing and moaning like a soul in pain."

THE long silence which ensued was broken at last by Geoffrey.

"Well—now that we've got this precious Kana, what are we going to do with him?" he demanded brusquely. "We can't keep him unconscious—he's got to have nourishment. We can't keep him prisoner. We have no right to do so, and, besides, it wouldn't be human. We can't turn him over to the Three, for that would mean the end of our work. And we can't turn him loose, for if we do, he'll go back to that mad master of his and plot more deviltries."

"You have summed up the situation with brevity and precision, my dear Geoffrey," commented the Doctor. "Has anyone any solution to suggest?"

The two younger men shook their heads dubiously, but Lotus, who had been watching the Doctor's face, exclaimed:

"Dr. Umetaro, I'm sure you have a plan! I can tell it from your smile and I'm equally sure that it's a good, kind plan."

"Yes, I have a plan, as your intuition has divined, Lotus San," admitted the Doctor, laughing, "Why should we not perform the Claverly operation?"

"But, Doctor, he will never consent!" protested Lotus, shaking her head. "We dare not perform it upon a normal person without his written consent and I am sure he would never give it."

"We will pass over the doubtful question of Kana's normality," replied the Doctor. "As to the impossibility of gaining his consent, I think I can promise to overcome his objections."

The others had listened to this conversation in uncomprehending wonder.

"What on earth are you talking about?" Ralph burst out. "What is this Claverly operation, and how does Lotus know so much about it, anyway?"

"Lotus San understands because she is a trained nurse," replied the Doctor.

"You—a trained nurse, my Flower?" cried Ralph.

"I have been a nurse in the Jacksonville Hospital for Abnormals for several years, dear," Lotus explained, "although how Dr. Umetaro knew of the fact is beyond me."

"We surgeons know many things," replied the Doctor cryptically. "As to the Claverly operation, it is an operation the technique of which was perfected by Dr. Samuel Claverly in the late years of the twentieth century. It is practiced occasionally upon persons of subnormal morality. Certain deeply seated portions of the brain are excised, resulting in a complete transformation of the mental attitude, without in any way affecting the intellect. It is a difficult and dangerous operation, and may be performed only with the written permission of the patient, as Lotus San has stated."

"I've heard something about the work at Jacksonville," Geoffrey said, "but I never knew anything in detail about the operations. Is it a fact that surgeons can open a man's head and rearrange his brains to suit themselves?"

"Not quite that!" replied the Doctor, laughing heartily. "The Claverly operation does not alter the character or intellect in any way. What it does is to change the direction or trend of the patient's mental processes."

"That sounds a bit obscure," Ralph commented.

"It's really quite simple," the Doctor elucidated. "You understand, of course, that the body contains certain tiny organs known as the ductless glands and that the function of some of these glands is to control the rate of growth of the body. Decrease the rate of flow from these glands and you produce dwarfs. Increase it and you produce giants.

"Let us compare the ductless glands to the carburetor of the old style gasoline engines. This mechanism, very small in comparison with the motor with which it was associated, controlled the rate at which the gasoline flowed to the cylinders. If the engine were driven at high speed, a tiny valve automatically permitted more gasoline to flow. If the engine were idling, the valve was partially closed, thus shutting off the atomized and gasefied liquid. This gives you a rough notion of the function of the ductless glands.

"Throughout the countless ages during which man has progressed from the 'beast' stage to his present

state, the ductless glands have been the controlling factor which enabled the body to conform to the requirements of the environment. They were the hand upon the throttle which guided the growth of the human body to its destined form. The truth of this is demonstrated by the fact that surgical interference with these glands results in a corresponding change in the rate or direction of growth, producing monstrosities.

ALL this was known a very long time ago, but it remained for Claverly to discover that there are groups of cells in the brain which are comparable in their functions to the ductless glands. These cells, in some mysterious way, which we have not been able to fathom, dictate the growth of the rest of the brain cells. One group seems to control what we call the intellect, others the memory, still others the trend or bias of thought. It is these last with which the Claverly operation is concerned. They are known collectively as the Claverly tissue.

"You must bear in mind that the development of the Claverly tissue, as of all the cerebral control tissues and the ductless glands, is the direct result of environment and evolution. Until the last few millennia, man was forced by his surroundings to be a combative animal, preying upon his fellow men, and upon the lower animals. The Claverly tissue gave the brain a bias or 'set' which accorded with these surroundings. Co-operation, brotherly love, and all the other social virtues which are commonplace today, would have been of little value to the cave dwellers ten thousand years ago; in fact they would have been a decided detriment.

"As the ages passed away and mankind gradually developed what we may call a moral sense, using the expression in its widest meaning, the Claverly tissue became modified. Men's primal instincts remained unchanged but their resultant emotion was altered. To make a comparison, wolves shun the flames of a camp fire, but the domestic dog, blood-brother of the wolf, seeks the fire in order that he may curl himself up beside it and enjoy its grateful warmth.

"Just so the modification of the Claverly tissue, itself the direct result of changed surroundings, has transformed destructive hatred to constructive energy, rage to enthusiasm, lust to love, malicious secrecy to the generous impulse which prompts us to conceal some pleasant surprise from a dear friend, that his enjoyment may thereby be enhanced.

"We find, however, even at the present day, certain persons whom we call abnormals, in whom the Claverly tissue is overdeveloped. Such persons exhibit exactly the mental traits which one would anticipate in a caveman. They are moral 'throw-backs'. They show a return in mentality to primeval stock, just as a man, with an excessively hairy body or overdeveloped canines, would show a similar return to first principles from a physical standpoint.

"The triumph of the Claverly operation is in the fact that by its help we are enabled to overcome or reverse this abnormal condition. By cutting away a small portion of the Claverly tissue, the patient's mind is given the requisite social attitude which will enable it to align itself with modern conditions, instead of being at war with all its fellow beings.

"Kana is one of these mental throw-backs. The Claverly operation will transform him into a useful member of society."

The others had listened to Dr. Umetaro's somewhat lengthy lecture with intense interest. Lotus was, of course, familiar with the subject, but it was all new to Ralph and Geoffrey. The latter propounded a question.

"You speak of gaining Kana's consent to the operation, Doctor," he said. "Do you propose to get his signature while he is under the hypnotic influence?"

"While that would be possible, my dear Geoffrey," replied the Doctor, "to do so would be exhibiting the very traits of unsocial deception which we are deploring in Kana. You see, while it would be Kana's hand which signed the paper, it would be *my* mind which guided the hand. In other words it would be hypnotic forgery."

"Then I don't understand how you will ever gain his consent," said Geoffrey, "for it is obvious that Kana is entirely satisfied with himself as he is."

Nevertheless, he will sign the paper and sign willingly, even eagerly," averred the Doctor.

"Explain yourself!" cried Lotus with mock imperiousness.

"I shall awaken Kana," responded the Doctor, "and give him a free choice between submitting to the Claverly operation or being taken into the presence of the Three. It is true that the latter alternative will mean the destruction of all our hopes for saving the commercial structure of the world, but it will also mean the end of Clifford Weatherby's dream of power. In his present state of mind it will be inconceivable to Kana, that the Master, as he calls Weatherby, can fail in the accomplishment of his ambitions. He will willingly submit to the operation therefore, although it will mean the end of his usefulness to Weatherby, because he knows that he, Kana, is only one cog in the machinery of Weatherby's nefarious schemes, and that the removal of that one cog can have little or no effect upon the whole mechanism."

"You have a solution to everything, Doctor!" Ralph exclaimed, in unconcealed admiration.

"Have I your permission to awaken Kana and offer him the choice I have indicated?" asked Dr. Umetaro.

All three signified their unqualified approval.

"Very well, then. Let us return to the study."

The negro was lying as they had left him. His head was pillowed upon one huge arm; his heavily muscled chest rose and fell with deep, even respiration; his thick lips were slightly parted in a half smile.

The Doctor stood above him, his slight, wiry physique contrasting strangely with the squat, massive bulk of the recumbent negro.

"Listen, Kana!" said the Japanese in deep, intense tones. "At the word of command you will awaken. You will regain your senses, open your eyes, speak. You will again be your own master in every respect, save that you will be unable to arise. Kana! Awake!"

KANA'S eyelids stirred, flickered, rose. Slowly, and at first uncomprehending, his eyes took in the scene, passing from one to another of the group. Then, as he caught sight of Ralph, the peaceful look vanished, to be replaced with an expression of such virulent hatred that Lotus shrank back instinctively with a little cry of dismay. At the sound, the blazing eyes with their uncanny white rims were turned upon her.

"So! You are all here?" he spat out. "You, too, woman, who has returned the Master's love and care by plotting with his enemies! You expect to companion with this heretic dog you call Ralph Morton. It is lucky for you that yonder yellow cur proved stronger than Kana or you would have found a nice, cold, twisted corpse to which you could have given your morning kiss!"

"Be silent, Kana," said the Doctor, mildly. "You are under my control now, it is true, but only that you may not further endanger our lives by your unnatural rage. I have come to make you an offer. If you refuse it, you are free to go and I myself will take you wherever you desire. We cannot hold you in re-

straint, for that would be to break the Law of the Triangle."

"It were better for you that you should drop me over the balcony as that elephant suggested," growled Kana, glaring at Geoffrey, "for be sure, if you free me, the Master's vengeance will be swift and terrible! Well, make your offer and let me go!"

"You have your choice of two things, Kana," said the Doctor, still in the same calm, unruffled manner. "Either you shall sign this paper of your free will or we will release you to go back to your master. But remember, that in the event of your choosing the latter alternative, we four shall be in the presence of the Three before you can reach Clifford Weatherby and to the Three we will make report of all we know."

Kana disregarded the paper which was held in front of his eyes and looked at the Doctor in amazement.

"You would go to the Three!" he muttered, unbelievingly. "The Three who would order the destruction of your laboratories and condemn you all to banishment!"

The Doctor made no reply, but pointed silently to the paper. Kana's eyes scanned it rapidly, and as he read, the hatred which he had previously displayed was as nothing to the consuming passion which now distorted his features.

"The Claverly operation!" he roared furiously. "You would submit me to the Claverly operation and make me into a whining milksop, like yourselves?"

"Only with your free consent, Kana," corrected the Doctor, silkily. "If you do not wish to sign, say so and you are free—until the Three send for you."

The play of emotions upon Kana's black face defied description.

"You devil!" he exclaimed at length, a touch of unwilling admiration in his voice. "Your choice is no choice at all! Who am I that I should purchase my soul at the price of the master's betrayal? Free my hand and give me the pen. But stay! If I submit myself to the Claverly operation, do you four swear that you will not report these events to the Three?"

"We promise, Kana, we do not swear," said the Doctor gravely, while the others nodded their assent.

"I believe you," hissed the negro, "not because I trust you, but because you dare not go to the Three! Give me the pen!"

The Doctor freed Kana's right arm and he signed the paper with a flourish.

"Bring on your butcher's tools!" he cried, flinging the pen across the room viciously. "I am ready!" He closed his lips and spoke no more.

Dr. Umetaro had come prepared for Kana's capitulation. In a moment he had adjusted around the negro's neck a metal harness to which were attached two projecting fingers, somewhat similar to the contrivance which Ralph had worn during his convalescence. Almost instantly Kana became unconscious.

"My substitute for the old-fashioned anaesthetic," explained the Doctor. "These fingers, by pressure upon the appropriate nerves, produce instant and complete unconsciousness, without in the least affecting the functions of the organs. As a matter of fact, it is perfectly possible to perform most operations with 'memory blocking' as I call the method I used on you, Ralph. As in the case of 'Twilight Sleep,' an anaesthetic in common use about two centuries ago, 'memory blocking' does not deaden pain at all. It simply causes the subject to forget pain the instant it has passed. I did not deem it wise to use the 'memory block' in Kana's case, on account of his violent temperament.

"Now, my dear Geoffrey, will you kindly carry our patient to the roof, while I prepare my instruments."

IN a little while Kana was lying face downward upon an improvised operating table which Ralph had erected. Lotus shaved away the kinky black wool for a considerable distance around the spot which the Doctor indicated, and performed the various preliminary preparations with the accustomed confidence of the skillful nurse.

Ralph and Geoffrey were both conscious of a qualm of suppressed horror as the Doctor, with swift movements, cut a series of free incisions in the scalp and turned back the flaps of skin, which Lotus secured by means of clamps. In this age of universal peace and health, neither of the young men had ever seen an operation performed and when the tiny, motor-driven saw began to bite into the exposed skull, it required an effort on Ralph's part to prevent him from turning away his head.

The complete unconcern with which Lotus did her share and a running fire of comments from the Doctor, had the effect of steadying Ralph's nerves and before long he found himself watching with admiration the slender yellow fingers as they guided the instruments.

"It was formerly customary to use a circular trepan," remarked the Japanese, "and the opening in the skull had to be closed by means of a platinum or silver plate. Claverly perfected the instrument which I am using. As you see, it removes a star-shaped plug of bone, which is then placed in this aseptic fluid. At the conclusion of the operation, the plug is replaced and grows into the skull."

When the surface of the brain lay bare to their sight, the Doctor gave a little grunt of surprise.

"No wonder Kana is a throw-back," he exclaimed. "The anterior portion of the Claverly tissue is nearly twice as large as in normal brains. Now gentlemen, comes the delicate part of the operation. I must ask you to be perfectly silent and to refrain from any sudden movement. Lotus San, please hand me the cerebrotome."

For the next twenty minutes Ralph and Geoffrey watched in breathless absorption a display of manual dexterity which, in spite of their inexperience in such things, filled them with amazement. When it was over, the Doctor laid aside his scalpel with a sigh of relief and picked up forceps, with which he replaced the star-shaped plug of bone. Finally, he drew the flaps of skin into place, sealing each incision with a liquid cement, which hardened instantly to the consistency of rubber.

"Another improvement for which we have to thank the Rebels!" he commented. "What do you think of it, Lotus San?"

"I think it's wonderful, Doctor," replied the girl, "but doesn't the cement interfere with healing?"

"Not in the least," the Doctor assured her. "It has every desirable property; rapid hardening, great tenacity, strength and elasticity, besides being completely porous, transparent and powerfully antiseptic. It may be removed instantly by applying this liquid."

"You see, Ralph," explained Lotus, "I have always been accustomed to seeing incisions stitched up. The surgeons at Jacksonville use no other method of closing wounds. Bad scars are often the result."

Involuntarily her eyes strayed to Geoffrey's face. She turned away instantly, flushing red in embarrassment that she should have caused pain by her careless remark.

"A relic of the dark ages!" smiled the Doctor, as he adjusted the last of the dressings. "Superficial sutures in the Age of Social Enlightenment! The modern outlook on science conveyed in a single sentence!"

Lotus mentally blessed the Doctor for his gallant at-

tempt to gloss over her discomfort, but she was not entirely happy. In one brief glance she had seen Geoffrey's face, redder than her own and with the ugly scar standing out in ghastly whiteness.

Her embarrassment lasted but a moment before it was driven out by another emotion. There swept across the tablets of her mind that undefinable sensation of witnessing a repetition of some long-forgotten experience. Who was this Geoffrey Von Elmar? Where had she seen that huge form and scarred face before? Why had the sight of him awakened no memory until she saw him turning away and flushing crimson with shame at her heedless remark?

There was no answer to these questions forthcoming, either then or later, when, restless and puzzled, she lay awake on her couch, turning the problem over and over in her mind and studying the face of Geoffrey Von Elmar as he lay sleeping in the moonlight.

CHAPTER X

The Discovery of Florium

AUTUMN was laying her golden hand on the mountains caressingly, glorifying the valleys with a riot of color, as though to soften the harshness of the coming winter, or, perhaps, to leave a memory of beauty which should brighten the tedium of the long, cold months.

The outlines of the peaks, shorn of their gaunt primitiveness by an enveloping mantle of blue haze, seemed to draw nearer and smile in gracious friendliness. Already a few brief flurries of snow had whirled their way flippantly up the glacier and whitened the summits, revealing shelves and ledges whose presence passed unsuspected until the feathery flakes settled there and revealed them.

The weeks had been filled with work and study for the four friends, with the added labor, in Dr. Umetaro's case, of tending the unconscious Kana. The advent of the negro with his news of Clifford Weatherby's underhanded schemes drove away all desire to relax their efforts. The Doctor had nothing to report from Rebel Headquarters save the daily message, "No results!" If only they could discover the antidote for the disease, they might yet save the ore in Antarctica which Weatherby's agents had infected. Perhaps Kana could be induced to reveal the secret.

Ralph suggested the possibility of this to Dr. Umetaro, who smiled inscrutably.

"By all means ask him," was all he said, but he shot a questioning glance at Lotus, who nodded in silent reply, as though the two had some secret understanding.

At last the day came when the Doctor proclaimed Kana completely recovered, though still very weak.

"Carry our friend to the balcony, my dear Geoffrey," said the little surgeon, "and I will restore him to consciousness. Come, Ralph! Come, Lotus San!" he called to the workers in the laboratory. "Let our friend awaken to his new life surrounded with smiling, friendly faces."

Geoffrey deposited Kana's inert figure on a reclining chair and the others gathered round wonderingly and a little doubtfully as Dr. Umetaro removed the bandages which swathed the black head. A touch with a brush dipped in liquid and the leathery adhesive came away. There was no trace of the wound except for the shaven spot and even this was already showing a new growth of hair.

Lastly, the Doctor removed the anaesthetizing clamps from the neck and stood back.

Slowly the heavy lids were raised and Kana looked from one to another of the smiling faces with puzzled, lifeless eyes, which no longer burned with their old-time animal ferocity. Suddenly his features were lit by the full flame of intelligence and he struggled to rise, only to fall back in weakness.

"The Claverly operation!" he murmured softly and again, "The Claverly operation!" He turned his eyes, all wet with tears, to the Doctor's genial face, and feebly extended his hand. "Thank you! Oh! Thank you, my friend. To think that I should have hesitated to sign! Your wish, Ralph! And you, Geoffrey and Miss Grenville. May the All Wise reward you for what you have done!"

As the days passed and Kana slowly regained his full strength, the amazement of Ralph and Geoffrey increased rather than diminished. Unconsciously, they had both questioned the efficacy of the operation and they regarded Kana's transformation as something of a miracle.

As though by direct contrast, the new Kana displayed a gentleness and sweetness which would have bordered on effeminacy, but for the inherent manliness of his character. Next to the Doctor, whom he worshipped with an almost canine devotion, Kana fixed his affections upon Ralph, displaying an attitude which seemed to imply the desire to make amends for some great wrong.

It must not be supposed that Kana had, in the slightest degree, forgotten his former life. He remembered it with as much vividness as though the Claverly operation had effected no change in him. Indeed, he retained many of his former characteristics, at least those which may be described as beneficent, as Geoffrey had occasion to discover with great emphasis, when he attempted to question Kana about Weatherby and especially with regard to the antidote to the iron disease.

"You find me much changed, my friend," Kana replied to Geoffrey's interrogations, "as indeed I am, but in one small matter the Claverly operation has made no difference. When Dr. Umetaro's blessed knife cut away the foul cells from Kana's brain, it did not remove his loyalty and faithfulness to those who had the right to claim them in the past. I loved him whom I called the Master. Inconceivable as it is to me now, I loved him. That my love has been transformed to hatred and disgust does not weaken my loyalty in those matters which concern my past existence.

"To you four I owe all that makes life worth living. Ask me what you will in repayment; yes, even life itself, and I will give it freely and gladly, but do not ask me to betray the secrets I learned before I was reborn, for you shall tear my tongue from its roots and burn my body to ashes before I will break silence."

The negro's lustrous orbs blazed with the internal fire which had chilled the blood in Geoffrey's veins at their first meeting, but now it was the fire of noble resolve and the young man turned away, ashamed that he should have so much as thought of asking Kana to descend to his former level of deceit.

THE passing of the centuries has not lessened the strangeness of what cynics are pleased to call coincidence, but which seers and scientists call Fate. Kana had broken into the hidden valley to spy upon and destroy its inmates. He had come equipped with all the powers of evil to accomplish his Master's ends. The transformed Kana was withheld by his innate sense of loyalty from rendering the help which he so longed to give. Yet it was through Kana that there came the first ray of hope which illumined the researches of the four workers, since they had undertaken the voluntary task of replacing the lost iron mines of the world.

It came about in this wise.

The four men were sitting on the balcony watching Orion heave his glittering shoulders over the eastern ranges. The chill of winter was in the night air and Ralph, ever watchful for the comfort of others, saw Kana shiver.

"My Flower," he called to Lotus who was preparing the sleeping couches on the roof-space. "Kana is cold. Will you bring him one of my tunics?"

Lotus brought the tunic and folded it around the negro's shoulders. He looked up at her with a grateful smile and buried his hands in the warm fabric. A moment later, he drew from one of the pockets a lump of some heavy material. When he held it up in the faint starlight, it shone with an unearthly, purple phosphorescence.

"What a beautiful thing!" he cried.

His exclamation drew the attention of the others and the glittering object was passed from hand to hand until it reached Ralph. He recognized it instantly.

"Why Lotus, do you know what this is?" he said. "It is a piece of the amethyst rock from the bed of the glacier. I broke it off and put it in my pocket when I left you to search for a way of escape. Look, Geoff!"

Geoffrey seized the gleaming stone and examined it, with growing excitement, by the light of his pocket torch. He had specialized in geology and his expert eyes immediately confirmed what Ralph had dimly suspected when he found the substance under the ice.

"It's new, absolutely new!" he exclaimed. "It's utterly unlike any known mineral. It has the color of an amethyst, combined with the softness of talc. It has the opacity and texture of chalk, together with a true phosphorescence far more intense than any other compound, either natural or artificial. This is certainly a find, Ralph."

Ralph took the brilliant stone from his excited friend and turned a smiling face to Lotus.

"It is the most beautiful thing in the world, Beloved, since it witnessed our meeting. When we are companioned, we will place it in our home to light the paths of memory."

"I appreciate your sentimental affection for this lump of rock, my dear Ralph," intervened the Doctor, quizzically, "but I fear that duty must come before sentiment. We made up our minds long ago to leave no stone unturned in our search for a cure for the iron disease. Surely this stone also must be submitted to the turning process, or, in other words, to analysis. Perhaps I am foolish, but that steady purple light seems to shine out with a promise of some great discovery."

"Of course, you are right, Doctor," Ralph replied. "I will start work on it tomorrow."

True to his word, Ralph plunged into the task of analyzing the new mineral at an early hour next morning. He was assisted by Lotus, whose training included a very fair knowledge of chemistry. Besides her technical qualifications, Lotus brought to Ralph the stimulation and encouragement which only her loving, sympathetic presence could provide.

Lotus' perfect comprehension of the work on which they were engaged made conversation unnecessary. There were long silences between them, silences which served to intensify the feeling of comradeship, a mental phenomenon which is a commonplace with those who share both work and pleasure. Sometimes, however, their absorption was broken by fragments of conversation.

"Explain something to me, Ralph," said the girl, on one of these occasions. "I know how people look upon the idea of scientific research. I understand, of course, that what we are doing now is utterly at variance with modern ethics. In fact, having grown up in strictly orthodox surroundings, I can't quite overcome the feeling that we're doing something horribly wicked in tampering with science. Are you quite sure that research work is not wrong?"

"Of course I'm sure, my Flower," Ralph replied, emphatically. "If any doubt lingered in my mind, do you suppose that I would permit you to remain here?"

"Perhaps I might have had something to say in that matter, my Ralph!" she smiled. "Of course, I accept your assurance, but I simply cannot understand how public opinion was turned against scientific progress. In the olden days, the progress of civilization was apparently measured in terms of the new inventions and discoveries which were made. What could have caused such a complete change in people's feelings?"

RALPH bent down to gauge the flow of a reagent from a pipette. He made no reply to Lotus' question for several seconds.

"In the first place, Beloved," he said straightening up, "the world in the olden days was not nearly so unanimous in its approval of scientific progress as you think. In those days, education was by no means as universal as it is today. There was a very curious tendency amongst the ignorant to draw a sharp dividing line between Pure Science or knowledge, and Applied Science or accomplishment. There has never been a period in the world's history when students of science for its own sake were not reviled and despised."

"But how could they expect accomplishment without knowledge?" asked Lotus, wonderingly. "One might as well expect a man to build a house without plans or—or to make bread without a recipe!"

"Or to kiss without lips?" Ralph added, laughing and illustrating his example. "Nevertheless, such was the case. Let me give you one example. Quite early in the twentieth century there were two great scientists. I am ashamed to say that I have for the moment forgotten both their names, but it doesn't matter. One was an American, the other a German. The American was not what we should call a great theorist, but he had a wonderful genius for applying the discoveries of others to the everyday uses of man. He probably made more practical inventions than any man who ever lived and he was universally revered as a benefactor of mankind.

"The German, on the other hand, was a dreamer of unsurpassed mathematical genius. He made discoveries in pure science before which the great thinkers of today stand amazed and spellbound. Was he honored for his mighty accomplishments? Not in the least! Except for a few far-seeing fellow scientists, his work was the subject of contempt and ridicule. So-called funny papers used him as the butt for their cheap sarcasms and the reputation of many a public speaker was made by the introduction of some stupid joke bearing upon the great Teutonic Scientist."

"But, Ralph! Why! Why!" cried Lotus, her lips trembling with indignation.

"Simply because you can't eat a mathematical formula, my Flower," Ralph answered, "neither can you build houses nor planes from the stuff of which dreams are made. The people were too blind, as they are today, to realize that theory must come before practice, as dawn must precede day. It was not until fifty years later, when some common mechanic discovered that this German's formulas were a complete solution of directed power transmission by radio, that the world awoke to the greatness of the genius whom they had derided. Even then, it was the mechanic who received nine-tenths of the credit!"

"How ridiculous!" exclaimed the girl. "Tell me more, Ralph."

In the midst of the chaos stood Ralph. . . . In his right hand he held aloft the bar of florium, shining with the ghostly blue radiance which illumined the moon.

"Most people think," continued Ralph, "that what we call the Orthodox Body of Scientific Beliefs was established at the same time as the foundation of the Board of Control in Santa Lucia, but the fact is that the world was prepared for such a change long before this. As early as 1920 various states and nations began to pass laws against scientific research. Don't make a mistake. It wasn't the application of science they objected to; it was *knowledge*. In effect, these laws said, 'You may build planes, install machinery, do anything you like to make our lives happier and more comfortable, but you must do it blindfold. You must neither study nor teach the very things which we wish you to accomplish.'"

"I have never heard this before, Ralph. Please go on."

"There's not much more to tell. As you know, the Age of Social Enlightenment brought about a healthier, saner way of life. One of the results of this was that people lost interest in pure science. It wasn't long before the world began to look back upon the scientists of the past as gods, or at least, as inspired prophets. The revelations of these divine beings were regarded as sacred. This attitude grew with the passage of time, until today the mere idea of adding to or taking from the Orthodox Body of Scientific Belief is looked upon with horror and loathing."

At last, the tedious and exacting work of analysis was complete. Ralph called the others around him and

displayed for their inspection a little cylinder of metal, measuring about three centimeters in diameter and twelve in length. It was azure blue in hue and shone with a steady radiance many times as intense as that of the mineral from which it was derived.

"Let me be the first to congratulate you, my dear Ralph," cried the Doctor. "There is no possible question that you have discovered a new element; the first to be added to the list for more than two centuries."

"A new element!" exclaimed Lotus. "What shall we call it?"

"How about glacium?" suggested Geoffrey, "in memory of the frozen chasm in which you found it?"

"Would it not be appropriate for the discoverer to have the honor of choosing a name?" spoke Kana, from his reclining chair, by the wall. The idea was unanimously approved.

"Then I shall call our new element, florium," said Ralph as he passed his arm around Lotus' shoulders and drew her to him, "in memory of the Flower which blossoms in my life."

"Florium! Accepted!" from the others.

"Excellent!" said the Doctor. "Now it only remains to determine the properties of florium and experiment with it in order to see if it will aid us in our task of curing the iron disease."

"That is not a long task," said Ralph. "I will start to work now."

"But it's supper time, dearest," protested Lotus. "Surely you have worked long enough for today."

"I could not rest or sleep until I have determined at least the principal properties of florium," Ralph answered. "Its hardness, elasticity, electrical and chemical reactions—it won't take more than a couple of hours. Just this once, have supper without me. I can't eat until I have finished," and he turned back to the bench.

Fifteen minutes later, Lotus, Geoffrey, Kana and the Doctor were gathered around the supper table on the balcony. The serene silence of a late September evening brooded over the valley and was mirrored in the silence of the four friends.

Suddenly, from the direction of the laboratory, came the sound of a tremendous crash. The entire building trembled as though with the impact of hundreds of tons of rock, falling from above. Clouds of dust billowed out of the open light-spaces and floated slowly away on the still air.

For a moment they sat in stunned terror. Their faces showed the simultaneous fear of some terrible catastrophe. Next instant they were on their feet and crowding through the door of the laboratory.

What a sight met their eyes!

The room was in semi-darkness. The opaque wall-screens had closed as the result of the tremendous shock, cutting off the light of day. Only by a bluish radiance which came from one end of the room and diffused itself into every part, they saw that all the elaborate equipment of the laboratory was torn from its fastenings and piled up in confused heaps, wrecked beyond repair. Benches, ferroverters, lathes, machine tools, were lying in tangled masses, many of the steel parts being bent into distorted shapes, as though by the clutch of some giant hand.

In the midst of the chaos stood Ralph. His tunic lay on the floor. His shoulder bore an ugly, ragged gash, from which the blood flowed freely. In his right hand he held aloft the bar of florium, shining with the ghostly blue radiance which illumined the room. His face bore an expression of ecstatic triumph.

"Florium! florium!" he cried. "All is solved!"

His knees sagged and his body slumped forward into Geoffrey's arms.

CHAPTER XI

Eternal Calm

SUNSET at sea. A sky, cloudless save in the west, where tenuous filaments of fairy gold hung motionless in a furnace of crimson glory, beneath which the ocean, unbroken by even so much as a breath of wind, heaved slowly. Far away in the northwest, a broken line of royal purple revealed the presence of a distant shoreline.

Ten thousand feet above the glassy surface of the sea, a single plane was cleaving the air with the quiet, effortless flight of a swallow. The plane was a small one, in comparison with the mighty ocean liners of the day, being a light six-seater, built for speed and comfort, rather than for carrying power. At first sight, the plane seemed to differ but slightly in design from the gasoline-driven airships of the early twentieth century, but closer inspection would have revealed marked difference in basic principle from the crude machines of those far-off days.

The wings, which were very small in proportion to the weight to be carried, were not covered with a uniform layer of varnished fabric or sheet metal, but were composed of thousands of tiny circular discs with spaces between. These discs, known as the Lifting Helices, were pivoted individually, each being provided with a driving motor no larger than a thumbnail.

The motors were something more than merely driving units, since they possessed the power of picking up the high tension oscillatory currents from the radio power-base and transforming them into rotary motion for the lifting helices, half of which turned in one direction and half in the other. The tiny motors were extremely simple in construction, being turned out in thousands by automatic machinery which was designed by the inventor in 1987, since when, of course, no change had been made.

No driving propeller was provided, the plane progressing by a continuous action of "falling down hill." This gliding process was made possible by the fact that the wings were true planes, since the little whirling discs formed a practically continuous surface. In other words, the planes of the twenty-third century were gliders, maintained in the air by a combination of vertical suction and wing support.

Radio power lines radiated from the huge hydrostatic and tidal power plants to all parts of the world and so long as a plane followed the beam, a plentiful supply of power was available. In the event of a plane leaving the beam, auxiliary power was provided by a vrilol generator. Vrilol, which is a liquid by-product of allotropic iron, possesses the property of generating high-tension current when driven at high pressure against gold wires. It has been known for many centuries that high tension or static electricity could be produced by means of high-pressure steam, but no use had ever been made of this principle until vrilol was discovered with its wonderful convenience and efficiency.

Occupying the control seat of the speeding plane was Ralph Morton, his shoulder in bandages. Beside him sat the Doctor. Lotus, Geoffrey and Kana were reclining in the luxurious chairs in the cabin, watching the ever-new marvel of the setting sun.

"We're a bit early, aren't we, Doctor?" remarked Ralph. "You said we mustn't reach our destination until dark."

"No, I think not," said Dr. Umetaro, replying to Ralph's question. "We have another five hundred miles to go and it will be dark in an hour. Night comes with startling suddenness in these tropical regions."

"What *is* our destination, Doctor?" Lotus asked. "You promised to tell us after we left land. Please don't be so mysterious!"

"I'm not intentionally mysterious, Lotus San," replied the Doctor, "at least not secretive. I asked you four to come with me on this trip because I wanted you to receive a pleasant surprise. I will tell you now that we are going to the headquarters of the Rebels; the meeting place of all the greatest scientists of the world."

"I suspected as much," said Geoffrey. "But you spoke just now of five hundred miles. The only land within that distance is Santa Lucia. Surely you don't mean to say that the Rebels meet under the very noses of the Three!"

"Hardly!" smiled the Doctor. "The Rebels are brave, but not quite as brave as that!" He would tell them no more, but turned his attention to his duties as navigator. Under his directions and guided by Ralph's hand, they hurled forward into the gathering gloom at a steady speed of just over four hundred miles an hour.

Once Ralph made a motion to switch on his lights, four in number, head, tail, "ceiling" and "floor" lamps, but the Doctor put out a restraining hand.

"We must fly in complete darkness, my dear Ralph," he said.

"It's going to be rather dangerous, landing without the floor-light," Ralph commented.

"Trust to my guidance and do not worry," the Doctor replied, briefly.

They were all straining their eyes for signs of land when the Doctor raised his hand.

"We have arrived!" he exclaimed. "Descend to five hundred feet and hover."

As the plane swooped down to the lower level and hung motionless in the air, they could see the reflection of the gleaming constellations below them, mirrored in the glassy surface of the sea. They were all wondering whether the Doctor had made some mistake in his calculations, but before any of the four could put their doubts into words, the smooth water was broken by some object which rose from the depths, like the head of a huge marine beast rising for air. As nearly as they could judge, this object was about two hundred feet in diameter and perfectly circular.

THE surface of the circle was jet black, but after a brief interval, a small spot of light appeared in its centre, rapidly spreading uptil the whole area was dimly illuminated.

"You had better let me take the controls," said the Doctor, moving over into Ralph's place.

The plane began to sink, at first swiftly and then with decreasing speed, towards the circle of light, which seemed to widen as they drew nearer. Now they were able to see that what had appeared as an illuminated surface was actually the mouth of a vertical shaft with polished walls. Presently they found themselves dropping down the shaft, and looking upward, could discern a circle of black sky, dotted with stars. A moment later there was a faint clang and their view was cut off by a metal roof which closed the upper end of the shaft like the closing of the iris diaphragm in the lens of a camera.

Perhaps, had not their absorbed interest in their novel surroundings distracted their attention, they might have seen a tiny speck against that blue-black sky; a speck like a watching eye hung motionless in the heavens, hovering—hovering!

Still the plane sank slowly and they realized that they were descending into the depths of the ocean. Looking down, they could see no bottom to the shaft, but on raising their eyes again, a new surprise awaited them. The roof was no further away than it had been when it first closed.

"Look, Ralph!" exclaimed Lotus, pointing up. "The top of the shaft is following us down!"

Her explanation was correct. The whole gigantic shaft was telescoping upon itself and, as it were, drawing them into the unknown abysses of the ocean.

The four friends were so absorbed in watching this strange phenomenon that they failed to notice that the end of their journey was at hand. There was a slight jar and the plane came to rest.

Geoffrey opened the door of the cabin and they stepped out into a great, circular room which was, in fact, the bottom of the shaft. They were looking about them, wondering what was to be the next stage in their strange adventure, when a section of the wall swung aside, revealing a broad archway, through which a group of people, clad in sombre tunics, advanced towards them.

As the group drew nearer, Ralph could see that it was composed of persons of all ages and of both sexes, but that they were alike in displaying a certain austerity of expression. Life in the Age of Social Enlightenment certainly promoted universal health and happiness, but the suppression of man's natural curiosity in scientific matters had tended to soften and beautify the features, rather than to strengthen them. It was in this respect that Ralph found the faces of the approaching group most attractive. They reminded him of pictures he had seen of the great thinkers of past ages. He realized, of course, that it was a clear case of natural selection. Only such as possessed the cast of mind which was revealed in the features of these Rebels, would voluntarily isolate themselves from their fellow-men at the bottom of the Atlantic Ocean, in order to be free to pursue their investigations unmolested.

While these thoughts were passing through Ralph's mind, the group of Rebels drew near and their leader, a finely built man of about seventy, raised his hand in courteous salute.

"Your wish, Ota Umetaro," he greeted the Japanese. "Your welcome to Eternal Calm is the greater that you bring with you the brightest ray of hope which has ever penetrated these depths."

"Your wish, Frank Darwin," answered the Doctor, returning the salute. "It is not I who bring the light, but this young man, Ralph Morton, whom you sent me out to find." He laid his arm affectionately around Ralph's shoulders.

"Your wish, Ralph Morton," exclaimed the Rebel Leader, clasping Ralph's hand in his, while the others clustered nearer to welcome the blushing young man who had excelled them all in his achievements. The Doctor introduced Geoffrey, Lotus and Kana by name, and each one came in for a share of congratulation.

"Our friend, Dr. Umetaro has revealed very little of your discovery, Ralph Morton," said Darwin. "We, with hundreds of other Rebels who are gathered to do you honor, are hungry for details. Tonight you will refresh yourselves and rest. Tomorrow, if it please you, we will meet in the Crystal Chamber to learn of your plan. Then we can decide what is best to be done and how we can overcome the opposition and prejudice of the Three.

A beautiful young girl, whose breastplate bore the name Gabrielle Sabre, escorted the travelers from the Landing Room, which they now saw was surrounded with hangars containing many light planes, similar to their own.

"There are visiting Rebels from Divisions all over the world," Gabrielle explained. "They have all come

to hear the good news of your discovery. I am official hostess for the year," she continued. "It is my duty and pleasure to entertain all who come."

"You are a scientist, are you not?" asked Lotus, who had fallen in love with the charming French girl immediately.

"Biology is my specialty," Gabrielle replied. "I am studying the possibilities of insect education."

"But don't your duties interfere with your research work?" Ralph asked.

"To some extent, but any regret I may have felt on that score is wiped out by the honor which has come to me tonight," Gabrielle answered, smilingly. "Besides, I have but two months more to serve. Then I am to companion and resume my investigations. That will be three great happinesses in one year."

They were passing through a long corridor with many arched doorways, through which they could catch glimpses of laboratories, wonderfully fitted for scientific work. Finally their guide led them into a small room, which they could see was one of a suite of three apartments. The one in which they stood was furnished as a dining room and the table was laid with six places. Adjoining it was the sleeping room and beyond that a curtained arch opened into a pool of clear water.

"No doubt you will enjoy a plunge after your long flight," suggested their hostess. "When you return, supper will be ready."

When they were revelling in the delightful coolness of the salt water, the astonishment of the three young people at the wonders they had seen, burst forth in a flood of questions, which threatened to drown the Doctor. What was the exact purpose of this marvelous submarine structure? When was it built and by whom? How had its very existence been kept a secret from the world? How could life be maintained in the absence of fresh air? Of what material was it constructed that it could withstand the tremendous pressure of the water?

"My dear children," laughed the Doctor, when he could stem the tide of interrogations, "you had better submit your enquiries to Gabrielle Sabre, who is far better fitted to answer them than myself. This I can assure you, that you have not seen one-tenth part of the wonders of Eternal Calm."

WHEN they were gathered at the supper table, the Doctor opened the conversation.

"These young people have been trying to asphyxiate me with questions, my dear Gabrielle," he said. "Perhaps you can satisfy their curiosity."

"What would you like to know?" asked the girl.

"First tell us the object of this wonderful place," Lotus begged.

"It is the Headquarters of the Rebels," Gabrielle explained. "Just over a hundred years ago, when the strong prejudice against scientific work first began to make its appearance, a little group of scientists, of whom Frank Darwin's father was the leader, conceived the idea of founding a secret society for carrying on research. The question of a retreat, where investigations could be continued unhampered, was their first consideration. It was Erasmus Darwin—he was a descendant of the great scientist of the nineteenth century—who proposed the establishment of a settlement at the bottom of the sea. This spot was selected on account of the suitable nature of the ocean floor, because of its being off the regular air-lanes, and also because of its nearness to Santa Lucia, the Island of the Three."

"A bold stroke of policy," commented the Doctor. "The Three would hardly expect to find men and women carrying on the forbidden work under their very noses."

"Eternal Calm, as we call the building, was the work of many years," Gabrielle continued. "In fact it is being continually enlarged, as our increasing membership demands."

"I should have thought," remarked the practical Geoffrey, "that a structure which had to withstand such enormous pressure would have to be built as a unit and then lowered into place."

"On the contrary," replied their hostess, "it was far simpler to make small sections and unite them on the site of the city. Have you noticed the shape of all the rooms?"

They had, in fact, been struck by this feature, but had supposed that it was part of an unusual architectural design.

"The whole city is built up of hollow polyhedrons of various sizes. This shape gives the maximum resistance to pressure with the minimum weight, if we exclude the sphere which, for obvious reasons, is impracticable. These many sided rooms are cast in one piece of gold-iridium-steel at a secret foundry in the center of Greenland. From there they are brought at night by fleets of planes and dropped into the sea. They are made of such thickness and volume that they are only slightly heavier than sea-water. Thus their weight under water is practically nothing. It is a simple matter for divers, working in specially constructed machines, to bring the various segments into contact and to weld them together electrically. As soon as the welding is complete, openings are cut between the various rooms by means of the oxyhydrogen flame."

"What puzzles me even more than the City itself," Lotus said, "is the fact that its existence has been kept an absolute secret for so many years."

"Ah! That is because you do not know its history," interposed the Doctor. "You imagine the secret to be in the hands of all the Rebels and that in the course of time some traitor would be sure to reveal what he knows. Explain our method, Gabrielle."

"The reason why the secret of Eternal Calm has been kept inviolate," said the girl, "is because it is known to no one. Neither I nor Dr. Umetaro nor any of the Rebels knows the exact location of the City."

"I don't quite understand," said Ralph. "You say no one knows the location of the City, yet the Doctor was able to come directly here."

"I said that *no one* knew the secret," Gabrielle explained. "I did not say *no thing!*"

"But how can a *thing* keep a secret?" Ralph ejaculated, "and *what* thing?"

"It is as simple as it is wonderful," explained their hostess. "There is a substance called centrion which Erasmus Darwin discovered, though whether he found it in the form of a natural mineral or whether he created it from other materials we do not know, for it defies analysis. The peculiar property of this centrion is the affinity which its parts possess for one another. This attraction is not physical, that is to say it is not tangible to the ordinary senses. It seems to act in some way upon the human nervous system.

"Darwin made or found a large mass of centrion, from which he cut twelve tiny pieces. Each of these pieces is mounted like a jewel in a ring, but in such a way that the surface of the stone touches the finger of the wearer. As long as the ring is worn, the wearer feels an irresistible urge in the direction of the parent mass of centrion. We call these rings the Pathfinders."

"But surely it would be quite simple to locate the Eternal Calm by surveying," demurred Lotus. "What is to prevent any one of the Rebels from taking bearings by the stars?"

"There are two things," elucidated Gabrielle. "One

is that the Pathfinders are entrusted only to Rebels of unquestioned integrity, like your friend Dr. Umetaro. The other is that no one enters or leaves Eternal Calm by himself."

"I think I understand," said Ralph, thoughtfully. "You have all promised *not to know* the site of the City; not to try to determine its location. There is not one chance in a thousand that one of you will prove unfaithful, but to guard against such a possibility, you go in and out in groups—one watching another. How simple and yet how effective. Still—I don't quite understand."

The Doctor regarded Ralph with an amused smile.

"You don't understand why I was permitted to enter without a companion Rebel," he said. "Why, my dear friend, there were at least two Rebels in the plane with me!"

"You mean—" commenced Ralph, doubtfully.

"Yourself and Geoffrey, of course," the Doctor cried. "The requirements for membership in the Rebels are mental requirements, a scientific type of mind. We have no promises or cumbersome rules. Our method of sending forth the Pathfinders is a wise tradition, nothing more. It was enough for me that you were scientists and—my friends."

"Thank the All Wise!" exclaimed Gabrielle. "If your hopes come true, the need for secrecy will soon be a thing of the past. But I forget my duties as hostess," she continued, rising and slipping her arm around the other girl. "Your Lotus blossom droops for weariness, Ralph Morton. Come, let us sleep!"

So they slept in Eternal Calm with the surface of the sea, now tossing restlessly in a freshening breeze, five thousand feet above them. And through the long night, that watching eye hung motionless in the heavens, hovering—hovering!

CHAPTER XII.

The Crystal Chamber

NEXT morning, if such a word can be used of a place where day and night are eternally the same, Ralph woke clear-eyed and refreshed, to find the others already up.

Gabrielle greeted them at the breakfast table, after their swim, and explained the programme for the day.

"Frank Darwin wishes you to see some of the wonders of Eternal Calm," she explained, "so he has called the meeting in the Assembly Room for this afternoon, at 2 o'clock. After breakfast, if it will please you, we will visit some of the laboratories."

"That will be splendid!" Ralph exclaimed. "You can't realize what a wonderful thing it is, Gabrielle, to find a place where science can be worshipped openly. At least it seems so to us, after all these years of playing hole-and-corner. Isn't that so, Geoff?"

"I fear that you will not find many of the worshippers at their devotions today," Gabrielle smiled. "You see, we have dropped our regular work to concentrate our energies on the Great Problem, as we call the iron disease. When news of your discovery arrived, the need for further research was removed and we felt unable to go back to our own work until we had heard your report, Ralph. Shall we go?"

Guided by Gabrielle Sabre the little party passed through innumerable many-sided rooms, while Dr. Umetaro kept up a running fire of comments. To describe the equipment of the laboratories would be to write a catalogue of every scientific instrument known to the Twentieth Century, with countless others which would have been unfamiliar and even meaningless to the savants of that age.

In one series of huge rooms were samples of all the discoveries and inventions which had been perfected by the Rebels in their secret retreat. Here they could look upon the accomplishments of two hundred years, lying idle until the coming of an age less bigoted than the present, when they would burst forth to usher in an era of material progress such as the world had never seen.

Ralph and Geoffrey were enchanted and even Lotus, to whom much of the scientific equipment was hidden in mystery, felt her sense of the romantic awaken at the sight of all these motionless machines.

"Here is a plane invented by Tanaka Kitana, a fellow countryman of mine," explained the Doctor, directing their attention to a slender structure of shining metal and glistening glass.

"Where are the wings?" demanded Geoffrey.

"There are none," elucidated the Doctor. "I call it a plane for lack of a better word, but it is equally at home in any of the three elements. It is sustained and propelled by means of inductive action. A system of coils, surprisingly simple considering what they accomplish, draws power from the beams and then acts repulsively upon the earth in any desired direction."

"Has it been tried out?" Ralph asked.

"Oh, yes!" answered the Doctor. "We have a similar one which we use for special errands at night. Only last year I used it to deliver some papers of importance to a Rebel Astronomer in the Andes. After I had carried out my instructions, I thought I would see what the machine would do, so I rose to ninety miles and circled the world. I did it in just under forty minutes!"

"Forty minutes!" Lotus gasped. "But, Doctor, that is nearly forty thousand miles an hour."

"I see that you are good at rapid calculations," smiled the Doctor. "Yes, that was the speed. It got uncomfortably hot, due to the friction of the air, even at that altitude, but I dared not go higher lest I run into meteorites."

Ralph and Geoffrey felt that they could have spent hours in studying the contents of this marvelous museum, but Dr. Umetaro would not permit them to stay for more than a few minutes.

"You have all your lives before you," he said. "Now, I want you to see our observatory."

"An observatory, a mile under water!" exclaimed Geoffrey.

"You will see!" smiled the Doctor. "Indeed, we have an observatory; a unique one, have we not, Gabrielle Sabre?"

They passed through a doorway into a small room, the walls of which were unlike any part of Eternal Calm which they had seen. The many-sided blocks were absent and the room was a simple dome, constructed apparently of some highly polished black metal.

Ralph looked in vain for any sign of a telescope or other apparatus which should be found in an astronomical observatory. The total contents of the room comprised half a dozen comfortable chairs and several metal standards bearing upon their upper ends objects which resembled reflectors, as indeed they were.

Gabrielle Sabre requested her guests to be seated and extinguished the single luxifer panel above the door. The room was plunged in darkness, which, in a few moments, gave place to a faint bluish glow. Slowly the mysterious radiance grew stronger, became endowed with movement, life. Ghostly shadows flitted back and forth, weaving and blending in patternless dances.

Suddenly the dome flashed into full brilliance. Lotus gave a little cry of dismay and shrank closer to Ralph. They were in the heart of a jewel, a sapphire of inconceivable transparency and fire, a mighty cerulean crystal peopled by Beings which gaped and goggled with

jaws and eyes whose devilish hideousness was partly offset by hues which rivalled the rainbow.

Dr. Umetaro's voice broke the silence.

"What do you think of our observatory, my friends? Here we come to watch the finny tribes with whom we share the seclusion of the ocean floor. The dome is allotropic iron, ten feet thick and more transparent than the finest glass. The reflectors flooded the waters with light for hundreds of yards. We never lack for entertainment or study, since the radiance attracts fish of all varieties, as a magnet attracts steel."

TIME ceased to exist for the four friends as they sat, wrapped in wonder, watching the ever-changing drama of life in the depths. Men have entertained the belief that the flowers were created to please their sense of beauty, but here were living blossoms upon which Nature had lavished her most gorgeous hues, where no ray of light could come to kindle them into visibility and where, save for the Rebel scientists, no human eye would ever enjoy them.

Here, a flock of tiny fishes, carmine shading into rose and splashed with glittering silver, fled before some invisible enemy and hurled themselves against the outer surface of the transparent globe whose curvature caused them to spread in all directions, like living sparks of fire from a rocket. Swimming with leisurely swiftness came the pursuer, a nightmare goblin of blue and gold, jaws bristling with a triple row of teeth like needles, protruding eyes of unblinking cruelty set close together in front of a grotesque, misshapen head.

Balked of its prey, or perhaps distracted by the brilliance of the reflectors, the six-foot monster paused to inspect its human watchers. As it hung there, intent, motionless save for the slow pulsation of fins and tail, a shadowy something darted out of the gloom with incredible speed and touched the side of the golden fish. Instantly the passive immobility was changed into a turmoil of struggle. In the light from the reflectors, the shadowy something materialized into a writhing, fleshy arm, studded with suckers and fully fifty feet in length.

In vain the golden goblin dashed itself hither and thither in hopeless endeavour to evade impending death. Another and yet another of the dreadful tentacles flicked out of the obscurity and fastened upon the doomed monster. Now the whole mass of the attacker was revealed in all its bestial ugliness. A bloated globe of flesh for a body, like a bladder distended with blood. A circle of tentacles, each as thick as a man's body. A segmented beak like a parrot's, each segment as large as an elephant's tusk and keen as a razor.

The implacable tentacles drew inward, and with a thrill of horror, the watchers saw the golden goblin drawn to that snapping beak. In a few seconds the drama of Life and Death was over. The last golden fragment disappeared into the hungry maw and the monstrous squid withdrew into the shadows from which it had emerged.

Lotus was trembling with disgust and even Ralph and Geoffrey were sickened by what they had witnessed. Seeing their emotion, Gabrielle extinguished the floodlights. They were once more in the little room of polished black metal.

"That is a performance of which we are always assured," commented the Doctor. "Soon after the observatory was constructed, that fellow took up his abode among some rocks close by. Whether it was instinct or intelligence I do not know, but he discovered that the light from the reflectors was a guarantee of a good meal. He is never satisfied with small fry. He waits for the appearance of a fish which will satisfy his hunger. Then he strikes. He has been there for over a century!"

"I've read of these giant devilfish," Geoffrey said. "In olden days, sailors called them sea-snakes."

"Sea Serpents, you mean, Geoff," corrected Ralph.

"Yes, there were legends in the old days of sailing vessels, but it was not until some time in the nineteenth or twentieth century that the truth of the legends was proved by the finding of a dead polyp on the sands, somewhere in the Gulf of Mexico. Am I right, Doctor?"

"I believe so," replied the Japanese. "However, Gabrielle Sabre is a much higher authority on these matters than I. Perhaps she can enlighten you."

"I think Lotus has seen and heard enough about our deep sea friends," said their hostess, smiling at the other girl understandingly. "Let us return to our apartments. When we have rested and enjoyed some refreshments, it will be time for Ralph Morton to meet the Rebels."

Two hours later, Frank Darwin entered the room in which the visitors were conversing after luncheon and raised his hand in salutation.

"Your wish, Ralph Morton! Your wish, Friends!" he greeted them. "The Rebels await your pleasure in the Crystal Chamber."

As Ralph followed the Rebel President through the corridors, he was conscious of mingled sensations of pride and fear. He was only a young man; young in years and very young in knowledge compared to the body of scientists which he was about to face. In the ecstasy of his discovery, failure had seemed impossible. During the journey to the City of Eternal Calm, the exaltation of his spirit was sustained by the enthusiasm of his friends. But now, when his proposal was to be submitted to the touchstone of the accumulated scientific wisdom of centuries, his heart failed him and his plans seemed wild and impossible.

Something of his thoughts must have been apparent in his features, for he felt a soft hand slipped into his and heard Lotus whisper, "Courage, dear!"

Then he was aware of a great blaze of light and raised his head to find himself standing in the arched entrance to the most marvelous room he had ever seen.

Well was it named the Crystal Chamber! Octagonal in shape and fully two hundred feet across, the domed ceiling was studded with countless thousands of jewels, whose facets glowed with polychromatic radiance. The colors were not fixed but changed constantly. Waves of rose and azure and ivory flowed and rippled and blended with whirling spirals of violet and emerald green. This might have been the paradise of the flowers, where the souls of the dying blossoms had come to mingle in an eternal dance.

Ralph wrenched his gaze from the glamorous beauty of that mighty dome and looked around him. He was facing a great crescent of terraced seats, filled with a multitude of men and women, all clad alike in the sombre brown tunics and breeches which were the customary costume of the scientists. Darwin slipped one arm around his shoulders and urged him forward a few steps in advance of the rest of the little party.

As though Darwin's action were a signal, the entire concourse surged to its feet and burst into a roar of welcome.

"Your wish, Ralph Morton!"

Slowly the whirlpool of colored light began to fade. Dimmer and dimmer grew the glory of those luminous crystals until only a faint pearly glow diffused itself through the great chamber. Ralph took another step forward and withdrew his hand from the folds of his tunic. A gasp of wonder went out as he raised above his head the tiny bar of florium. Its ghostly purple radiance seemed to shine with the promise of secret power, of unrevealed mysteries.

Ralph's courage returned and he began to speak.

WHEN Ralph Morton concluded his brief address, there was no repetition of the enthusiasm which had greeted his entrance. The assemblage waited in silence as the light flowed back into the crystal dome and the blackness of despair enfolded the young scientist. He had failed to convince them! Florium was nothing but a foolish dream; a vapor dissipated in the cold wind of superior knowledge.

A little group detached itself from the silent audience and approached him. Half a dozen grave-faced men and women, led by a white haired giant who took from Ralph's nerveless hand the little bar of florium. Silently the glowing wand was passed from one to another. When all had examined it, the aged giant turned to the assemblage.

"Friends!" he said, his low voice throbbing with emotion, "eighty years ago today I entered Eternal Calm. For eighty years I have probed the secrets of that mysterious fluid we call electricity, the fluid which is the framework of all created things. It has remained for this young man to reveal a secret greater than any of which we have knowledge.

"The world is in need. If the metal which has been called florium in honor of this fair girl, actually possesses the properties which Ralph Morton states, it will fill the great need of the world today. There is no reason to doubt the efficacy of florium. Its powers have been witnessed by our friend Dr. Umetaro, whom you all know. It remains only to convince the Board of Control that the time has come to cast aside the bigoted prejudices of centuries and permit science to come into her own again. Once this permission is obtained, the lost iron, which is the life blood of civilization, will be restored.

"Nor will this be the sole result of Ralph Morton's discovery. Once the barriers are broken down, science will again be free to shed her countless blessings upon mankind. Ralph Morton, in the name of the Rebels, I thank you!"

Then indeed the silence was broken. Shouting for joy, the Rebels crowded forward to shake Ralph's hand and to congratulate him. It was long before any semblance of order could be restored.

When at last Darwin was able to make himself heard, his voice rose above the turmoil of excitement.

"Friends! Friends!" he cried. "In the delirium of our joy, do not let us forget that we still face an almost insuperable difficulty. We have to overcome the bastions of human prejudice and inertia. Whom shall we send to the Three?"

"Ralph Morton! Ralph Morton!" shouted a hundred voices.

"You have heard, Ralph Morton," Darwin said. "The danger is great. You may be exiled or even imprisoned as a heretic. Perhaps we ask too much from one who has already given so generously. Will you go?"

"Of course I will go!" accepted Ralph, without hesitation. "Alone? Perhaps that will be best. If I fail, another can try."

"No, you shall not go alone, Ralph Morton," said Darwin. "You shall choose your own companions. There is not a Rebel who would not gladly face worse than imprisonment for the Cause."

"You will come, will you not, Geoff?" Ralph asked, turning to his friend.

He looked for instant acquiescence. To his astonishment, the blond Vulcan, the very embodiment of fearlessness, cringed and threw up one hand, as though he had been struck.

"I cannot! I dare not!" he muttered, his scarred face ghastly white. "Ask me anything—my life if you will—but not that! I dare not do what you ask!"

Before Ralph could protest, Kana interposed.

"Will Kana serve in Geoffrey Von Elmar's stead?" he asked. "I have a debt to pay."

"I shall be glad to have you, Kana," Ralph said heartily, "not because of any fancied debt, for I know of none, but because I trust you."

"We three will go," suggested Dr. Umetaro. "Ralph Morton as the messenger, Kana as the guardian, and I to pilot the plane, for we will take Kitana's machine. If we have not returned in three days, you will know that we have failed. Geoffrey will stay to watch over Lotus San and to hold the secret of the florium ore bed."

"Do not worry," said Kana, confidently. "We shall not fail. Kana scents success in the air and Kana knows! He is changed, but he is still a Zulu."

CHAPTER XIII

The Place of the Three

IT was the hour before the dawn. Black night brooded over the tossing ocean, but the great entrance chamber to the City of Eternal Calm, five thousand feet below, was flooded with light.

Hundreds of silent, brown-clad figures lined the circular walls. The Rebels had come to bid Godspeed to the dauntless three who were about to set forth upon an errand, the success of which meant so much to the cause they loved—the cause of science.

At the centre of the floor, immediately below the sliding, watertight doors of the telescopic shaft, rested the flier which was to take them to Santa Lucia, the island of the Three. A slender cylinder of burnished silver, with graceful, pointed ends, the flier showed absolutely no external evidence of mechanism. No driving screws or supporting wings broke the glistening curves. It seemed the embodiment of speed; but lacking the means of propulsion.

Ralph Morton, Dr. Umetaro and Kana stood beside the flier, saying their last farewells to a little group which included Lotus, Geoffrey, President Darwin, Gabrielle Sabre and the snowy-haired electrical engineer, Olaf Ericsson.

Ralph took advantage of a conversation between Ericsson and the Doctor, in which the others were absorbed, to draw Lotus aside.

"Do not worry, my Beloved," he whispered. "It will all be over in twenty-four hours. Either we shall persuade the Board of Control to give science a chance or we shall fail. Even if we do fail, I am sure that the Three will not punish us; at least not severely. After all, we are risking our freedom to help the world. In justice they can hardly be very harsh with us, even if they look upon us as heretics."

Characteristically, Lotus passed over Ralph's arguments and went back to his first words.

"I am not worrying, my Ralph," she assured him with a smile whose radiance gave evidence that she spoke the truth. "I am not a psychic, like Kana, but I am a woman. I know that you will succeed. Don't ask me how. I simply know."

"Yes, you are a woman, darling. *My* woman," he said softly, putting his arm around her. "You allow your love to control your judgment."

Lotus rubbed her cheek against his shoulder and laughed.

"You will see!" was all she would say.

"I wish Geoff was coming," Ralph said in a troubled voice. "I don't understand his attitude at all. I should have said that he would be the last man in the world to show the white feather."

Lotus laughed again, a little ripple of amusement.

"You don't know your friend as well as I do, dearest.

Ericsson concluded his conversation with the Japanese doctor and the latter beckoned to Ralph.

"It is time we were on our way, Mr. Morton. We must leave Eternal Calm before any ray of light can reveal its presence to passing planes. Good-bye, Mr. Darwin. Good-bye, friends."

As Ralph kissed his companion, her eyes smiled up into his with an expression of such complete confidence that he followed the Doctor into the entrance of the flier almost light-heartedly. Something of Lotus' assurance communicated itself to his handshake with Geoffrey and his hearty, "Good-bye, old fellow. Get your plans ready for the florium mine. We'll be back this time tomorrow with *carte blanche* from the Three!"

Dr. Umetaro touched a switch and the door slid silently into place. For a moment they were in darkness and then panels slid back revealing heavy ferrover windows above, below and on both sides.

Glancing upward, Ralph saw that the roof of the shaft was rising. The mighty telescope was extending itself against the pressure of the water—a pressure of

Ralph had one glimpse of the faintly luminous mouth of the shaft, which was girdled with a wreath of foam.

I am perfectly certain—as certain as if he had told me with his own lips—that Geoffrey Von Elmar has some good reason for not going with you. There is something which makes him feel that his presence would be dangerous, not to himself, but to your mission. Did you see how the scar flamed on his poor face? I know Geoff well enough to have noticed that that is not a sign of fear within him, but of anger or excitement. Tell me, Ralph, how did he get that injury?"

"He never told me, my own. As you know, we were at college together. At the end of our fifth year, he went away for the summer holidays without telling me where he was going. When he returned, his face bore that awful scar. He declined to say what had happened and neither of us had mentioned it since."

nearly two hundred tons on every square foot of its surface. The Doctor turned a control knob and the flier lifted smoothly from the floor and began to follow the moving roof.

There was no beat of engines or whirr of mechanism. Supported upon a yielding column of electrical force, they floated upward as lightly as a ferroloid ball on a fountain. Far below, Ralph could see a fantastic mosaic, hundreds of white faces upturned and in their midst a flash of azure blue as Lotus snatched off her tunic and waved it in a last farewell.

The crowded entrance chamber drew together rapidly to a vanishing point and Ralph could see nothing but the polished walls of the shaft, which seemed to be rushing down into the abyss. In a few moments the movement slowed, then ceased, and he was aware of a curious, irregular thudding noise.

"Stormy weather up here," the Doctor observed "Well, that will do no harm. Rather it will reduce the chances of a stray plane catching sight of us."

The great iris diaphragm which closed the upper end of the shaft, swung open, revealing a circle of inky blackness across which flew spatters of spume in the grasp of a howling gale. The Doctor touched the controls and they shot up into the night. Ralph had one glimpse of the faintly luminous mouth of the shaft, girdled with a wreath of foam. Then the diaphragm closed and the ocean once more hid the secret of the City of Eternal Calm.

The Doctor allowed the flier to rise to a height of about a thousand feet above the sea and then, glancing at the compass, prepared to set his course for Santa Lucia. He explained to the others that it might be necessary to wait until daylight before landing, as he did not know the exact location of Eternal Calm. The Pathfinder which he wore upon his finger, was useful for finding their way back. It could not help them to reach Santa Lucia or any other point on the surface of the globe. They must fly blind and trust to observations after daylight.

The Doctor was about to make some further remarks, when Kana gave a cry and pointed downward through the floor panel. Far below Ralph saw a disc of light, intensely brilliant, in which the tossing waves were revealed with stereoscopic vividness. For a moment he thought that the entrance to Eternal Calm had been reopened. Then the radiant circle began to move in a rapidly widening spiral and he realized that it was caused by a beam of light falling upon the sea from above.

"I anticipated something of this sort," remarked the Doctor, calmly. "Hold tight, gentlemen!"

Suddenly the nose of the flier dipped downward at an angle of fifty degrees or more. The Doctor touched a switch, shutting off the current in the repelling coils, and the flier fell like a meteor towards the ocean. As Ralph clung in breathless nausea to his seat, he caught a fleeting glimpse of that whirling spot of light. It rushed towards them, touched, hovered, bathed them in its ghastly white rays. Then the needle-sharp nose of the falling flier cleft the water almost without impact.

Next moment there was a tremendous, jarring shock, followed by the roar of an explosion. All three men were hurled from their seats to the floor, while the flier quivered as though in agony.

WHEN Ralph picked himself up, to find no bones broken, Dr. Umetaro was already at the controls. Through the windows, Ralph could see the water rushing by with incredible speed. Then the panels slid over and shut off the sight.

"By the Three!" he exclaimed. "What was that?"

"A message from Clifford Weatherby," grunted Kana, staunching the blood from a cut in his cheek.

"From Weatherby?" repeated Ralph. "How do you know?"

"I know his methods," responded the negro. "I've been conscious of his presence ever since we entered Eternal Calm. I thought he would try to get us when we left."

"One must acknowledge that our friend Weatherby is persistent," remarked the Doctor over his shoulder, "but his style is somewhat crude. Depth bombs went out of use several centuries ago. He should have consulted the Rebels. They have perfected a form of oscillatory current—a kind of ray—which would have turned the flier and us with it into gas, in a fraction of a second. Of course, the Rebels did not design the ray for any such purpose. It is intended for civil engineering work; mining, tunnels, canals and that sort of thing."

For an hour the silver needle fled towards the southeast. Five hundred feet below the surface, the three men were safe from the hatred of Weatherby and his followers. Conversation languished and there was a long silence, save for the shrill hiss made by the flier as it sped through the water.

At last, the Doctor placed his tiny radio wrist watch to his ear.

"Five o'clock," he announced. "We'll go up now. We've come three hundred miles from Eternal Calm and Weatherby dare not trouble us by daylight, even if he could find us."

A touch on the controls and the nose of the flier tilted up at a sharp angle. The Doctor switched off the interior lighting and slid open the window panels. For a few seconds they were wrapped in profound darkness. Then came a faint glimmer of bluish green growing rapidly stronger and culminating with startling suddenness in a burst of sunshine as the flier leaped from ocean to air, shaking from its glittering sides a shower of sparkling spray and leaving a pattern of concentric ripples to mark, for a few brief seconds, the spot whence it came.

Freed from the retarding friction of the denser element, the flier shot upwards with constantly accelerated velocity. Ralph could only guess at their speed, but he knew that it must be far in excess of anything he had experienced, for, looking downward, he could actually see the bounding circle of the horizon widening.

"Look up!" advised the Doctor.

Ralph turned his eyes to the upper windows and gave a gasp of amazement. The sky was no longer azure blue, but a deep blue-black and studded with stars whose number and steady lustre were much greater than the heavenly orbs when viewed from the surface of the earth. Low in the east hung the sun, a globe of intolerable brilliancy, surrounded with a girdle of crimson flames.

"Eighty-five miles," remarked the Doctor, pressing a switch. "High enough, I think. We're practically out of the atmosphere. What do you think of our stellar universe now, gentlemen?"

Ralph was searching his mind for a reply which would not seem futile in the face of this glorious display when Kana, who had been standing motionless at one of the windows, suddenly flung himself prostrate on the floor, uttering broken, unintelligible phrases in the Zulu tongue. Presently he raised himself and spoke in English.

"Indeed, indeed Kana owes a debt he can never pay!" he exclaimed, as though unconscious of the others' presence. "Ambition—power—wealth! What puny things, when the All Wise has vouchsafed Kana one glimpse of His splendor!"

Ralph's emotions were too deep to permit of speech. He reached out his hands and clasped those of Kana and the Doctor. At last the latter broke the silence with a sigh.

"We must return," he said. "It is too dangerous up here without the air to shield us from the artillery of heaven. Look, there is our destination!"

He pointed down to where a chain of emerald beads broke the blue convexity of the ocean.

"Santa Lucia, The Island of the Three," said the Doctor and turned the nose of the flier to the east.

In half an hour they were hovering above a grove of stately cabbage palms, beyond which a line of creamy surf kissed a beach of golden sand. There was no sign of human habitation and the Doctor dropped the flier gently to the ground in an open space among the trees. The three men stepped out upon a sward of green velvet. Great sheaves of spotted orchids hung pendant from the branches of a towering cinnamon. Masses of mauve bougainvillea afforded harborage for butterflies of incredible wing-spread and every conceivable hue. Far away were purple hills and over all arched the blue dome, flecked with fleecy cloudlets.

"Centuries ago men called them the Summer Isles! Surely the name was a happy choice," philosophized the Doctor. "Well, my friends, our task is before us. Let us face it."

From a pocket of his tunic he produced three jewelled name-plates and handing one to each of the others, bid them substitute them for the ones they wore on their throat chains. Glancing at his wonderingly, Ralph found that it bore the name "Prometheus." Kana's was inscribed "Enceladus" and that of the Doctor "Æsculapius."

"A fanciful notion of Frank Darwin's," explained Dr. Umetaro, smiling at Ralph's puzzled expression. "He thought it wise that we should interview the Three incognito. Do you not think the names are appropriate?

"Oh! Quite so," Ralph acknowledged. "A bit flattering in my case!" And if he blushed and seemed agitated, the Doctor attributed his evident emotion to modesty, or possibly to a natural dislike of masquerading under false colors.

"Let us be on our way," advised the Doctor. "I chose this place for our landing lest the sight of the strange flier might cause alarm. The Place of the Three is five miles from here, in the hills. We will walk."

They started on the final stage of their fateful journey, Kana carrying a metal case about a foot square. Soon they emerged from the trees and followed a winding foot-road, bordered with luxuriant vegetation. Here and there they passed thatched cottages with bamboo walls, surrounded by gardens in which grew tropical flowers and shrubs in great profusion. The universal spread of civilization and culture had not altered the mode of life in these happy islands. These simple cottages were cool and comfortable. What more could be desired? Only the senseless spirit of emulation which caused so much heart-burning and poverty in the old days could have prompted a wish for change.

THE road wound its way towards the uplands and finally, after an hour's walk, brought them to a gently rolling plateau. Here the sight that met Ralph's eyes caused his thoughts to turn to Boccacio and the gardens of Italy. Serene-faced men and women wandered among a riot of blossoms or reposed on cushioned seats in the shade of mighty ebony and teak trees. Through openings in the foliage one caught vistas of graceful dwellings. On a slight rise in the centre stood a magnificent building of ivory and crimson ferrolith, its slender, fluted columns and sculptured architrave displayed the exquisite charm of modern architecture at its best and noblest.

It was the Place of the Three, the seat of the Board of Control, the centre of Government for a whole planet.

Seeing that they were strangers, a pleasant featured young man approached them and bowed courteously.

"Your wish, friends," he accosted them, smilingly. "How can I serve you? Are you visitors of pleasure, or have you business with the Board?"

"We wish for audience with the Three," explained Ralph. "Our business is urgent."

"The Three are the Servants of the World," stated the young man sententiously, as though he were quoting a ritual. "Just at present, however, they are exceedingly busy with this storage of ore in Antarctica. A rather terrible thing has happened, you know. Perhaps you have heard. The ore dumps on the ice have become infected with the disease. It looks as if matters were approaching a crisis."

"As a matter of fact, our business concerns the iron supply," Ralph said. "We have a report to make."

"You are mine superintendents, perhaps," suggested the other. "I don't remember your faces or——" he hesitated, his eyes on Ralph's breast, "your names."

"We are not connected with the mines," Dr. Umetaro interposed. "Nevertheless, we have certain suggestions to make which may be of benefit. We have come a long way, and greatly desire an audience with the Three."

"You must be weary," sympathized the young man. "Come with me and I will see that you have rest and refreshment. Where is your plane?"

"Not being familiar with the island, we left the plane by the sea shore," explained Ralph, as they accompanied their new friend towards a small building which glowed like a garnet among the trees. "We walked from there, so breakfast would be most welcome."

"This is my home," volunteered the guide, whose name-plate bore the words Tsen Sheng. "Perhaps you will graciously accept my hospitality during your stay."

They entered a circular court, open to the sky and with a fountain playing in the centre, and were greeted by Tsen Ling, their host's companion.

"While you breakfast, I will interview the Three," Tsen Sheng said. "I am one of the Secretaries to the Board and will endeavour to arrange an audience. Of course, the Three are the Servants of the World, but they are indeed very busy. Nevertheless, I will do what I can. Let me see; the names," and he pulled out his tablets. "P-R-O-Prometheus. Is that correct? And the others. Forgive me, but I don't think I have ever seen names quite like them. The A and the E joined together! Quite unusual, is it not?"

A touch from the Doctor restrained Ralph from speaking and the bland little Chinese secretary hurried away on his errand, leaving his guests to the ministrations of his charming, yellow skinned companion.

An hour later Tsen Sheng bustled in, smiling more cheerfully than ever.

"The Three will grant an audience," he announced. "As I told you, the Three are the Servants of the World. They will meet you in the Palm Grove this evening at sunset. We are fortunate, are we not, my Delight?" he said, beaming at Tsen Ling. "Our friends will be able to remain with us until nightfall. When they have rested, we must show them our beauty spots, although the Place of the Three is all so delectable that it is hard to pick out one spot which exceeds any other in loveliness."

Escorted by the cheery Chinese couple, the three friends spent the day wandering through a Paradise

on earth. Dr. Umetaro and Kana possessed the happy faculty of being able to detach their minds from worry and both enjoyed themselves to the full, but Ralph's nerves were in a tremor of excitement and it was with intense relief that he heard Tsen Sheng announce that it was time to return for the evening meal, after which they would go to meet the Three.

The sun was setting over a sea of sapphire glass as they left Tsen's home and followed the secretary along a winding pathway bordered with Hibiscus and Oleander, from which they emerged into a grove of graceful Crown Palms. A short distance away was a cluster of seats. Three figures rose as they approached and Ralph's heart leaped and then sank as he recognized the big Irishman, Hector Shawn, the dignified Hindoo, Kanzo Singh, and the svelte French woman, Felice Mincheau.

"Your wish, friends! How can we serve you?" boomed Shawn's deep voice.

They were in the presence of the Three

CHAPTER XIV

Kana Pays His Debt

THE Three resumed their seats and waited with grave, attentive faces for their visitors to speak. Ralph hesitated, appalled at the realization that upon his shoulders rested the hopes of all those earnest, brown-clad men and women, far away beneath the Atlantic. It was not sufficient that he had made, almost by accident, a discovery fit to rank with the greatest in scientific history; a thousand others had done as much or more.

No, the discovery of florium was a means to an end. It devolved upon him to demonstrate the properties of this mystery metal so convincingly that the Three would be forced to acknowledge the supremacy of science; would lift the ban from the practice of research and pave the way for a new era of material progress. Who was he, a man still in his early youth, that he should dare to hope for success in a combat with the prejudices of centuries?

These thoughts flitted across the background of Ralph's mind. In the meantime the Three sat silent, gravely attentive; the giant, Shawn, with his piercing black eyes and cloven chin; the austere philosopher, Kanzo Singh, erect and dignified; the gentle Felice, with an expression of disarming sweetness, beneath which hovered a hint of the unswerving will and unfaltering sense of logic, which had won her a place as one of the joint rulers of the globe.

Ralph tried in vain to marshal his forces, to muster the arguments he had conned over so many times in the past few days. He glanced despairingly at Kana and the Doctor, but his two friends stood with downcast eyes. They felt instinctively that the time had come for Ralph to take the initiative.

Suddenly there flashed across his mind a picture; a vision of hundreds of white faces upturned to his, the faces of the Rebels at the bottom of their great shaft. He saw the flicker of a blue tunic waved above a golden head. He heard a calm, confident voice whispering, "Courage! You will succeed." He felt the warm pressure of a parting kiss.

Ralph raised his head. His eyes met the enquiring gaze of the Three with power and assurance. He took a quick step forward and began to speak.

"Servants of the World, I Prometheus, together with my friends Æsculapius and Enceladus, have sought this audience on a matter of great moment. We have come from a great distance and have encountered strange perils on our journey. In order for our errand to be successful, it will be necessary for the Three to cast down and trample upon beliefs that have been theirs from infancy—yes, and their fathers' and their fathers' fathers before them.

"It would be rash for me, a young man, to attempt to convince any man of error, but it is the height of presumption for me to hope to mould the minds of the Servants of the World into a new pattern. Nevertheless, I purpose to attempt the task. Because the task is so great and because we three have risked much to undertake it, therefore I plead with you that I may be heard in patience and with an open mind, and that I be forgiven if I fail. Is it granted?"

As Ralph paused, there was modesty but no humility in his bearing. There was silence for a few seconds and when, at last, Kanzo Singh spoke, his words had no reference to Ralph's request.

"There was a young man, a reporter, at the Ironmasters' Convention where we first heard of the disease. He greatly resembled this young man, but he was dark-skinned, while this man is white. He said that he came from the Hindoo Division. Our friend here is obviously American. The reporter's name was Morton. This man's name-plate is inscribed Prometheus."

"Prometheus and Ralph Morton are one, Kanzo Singh" said Ralph, neither glance nor voice faltering, "but you are wrong in one respect. You asked Ralph Morton if he was of the Hindoo Division. He replied that his mother was an American. It is many years since any man has worn upon his plate any name save his own. That I have done so is because the need was great and I ask that this also be glossed over until I have revealed our errand. Again I ask, is it granted?"

"But the names you bear now are strange and meaningless," objected Hector Shawn. "Why should we listen to men who must perforce veil their true identity under an outlandish jargon?"

"I think I can enlighten you as to that, Hector," interposed the gentle voice of Felice Mincheau. "These names are perhaps an allegory. They are taken from ancient Greek mythology. Enceladus was a giant who was buried beneath Mount Etna as a punishment for ambition. Æsculapius was the god of medicine and surgery. As for Prometheus, he was a young man who attempted to steal fire from heaven."

Shawn nodded his head thoughtfully.

"It is well, Prometheus, Æsculapius and Enceladus," he rumbled. "The Three will hear your message and withhold judgment until that message is complete. Your petition is granted. Are the Three in accord?" and he gave the sign of the Triangle, to which the other two duly responded.

"Be seated!" commanded Shawn, and when the three men had complied, "Speak, friend Prometheus, who aspires to bring fire from Heaven! Tsen Sheng, record."

"It is unnecessary," began Ralph, "for me to remind the Three of the commercial and social upheaval which threatens the world as the result of the disease which has destroyed the iron deposits. Tsen Sheng has told us that even the salvaged ore has contracted the disease. Indeed we were already aware of this, though it was not an accident, as you suppose, but the deliberate work of an enemy.

"WE feel that the Three would be remiss in the performance of their duty as Servants of the World, if they neglected any means by which the catastrophe may be averted. If, for example, some man came to you and revealed the existence of a hitherto undiscovered supply of iron, so vast in extent that it would supply all the needs of mankind for thousands of years, you would gladly accept his offer of help and would

place at his disposal every facility to open up the new body of ore. Am I right?"

"You are right. Proceed," Shawn said.

"We have discovered such a supply," announced Ralph, rising to his feet and pointing upward to the clear, star-gemmed night sky. "Servants of the World, what do you see spanning the heavens like a mist of light?"

"It is the Milky Way," replied Kanzo Singh, wonderingly.

"Look where the countless stars of the Galaxy cluster thickest in the zenith. Again, what do you see?"

"We see a circle of darkness, like a black hole," said the Hindoo.

"Watch closer!" commanded Ralph.

There was a long silence as all eyes were turned up to that inky disc. Then Kanzo Singh burst out into a cry of amazement.

"By the All Wise, it moves! It moves!"

"Servants of the World," Ralph said, his low voice tense with emotion, "that black moving spot is a globe of solid iron. Like the moon, it is a satellite of the earth, but unlike the moon it is comparatively close. There, in the sky are countless millions of tons of untainted iron to replace the ore we have lost. To tell you of this inexhaustible supply we have come to seek this audience with the Three."

In the dim light from hidden lamps among the trees Ralph watched the varied emotions upon the faces of his listeners, as he made his announcement. Hector Shawn knitted his brows in anger. Felice Mincheau looked at him with a glance of mingled pity and wonder. Kanzo Singh, the mystic, alone of the Three, maintained his expression of grave attention. It was he who spoke.

"I begin to understand the significance of your name, Friend Prometheus," he said, a faint smile twitching the corners of his mobile lips. "We will pass over the extreme improbability of your statement. The wise men of old have told us nothing of a second moon, therefore, no such body can exist. Nevertheless, for the sake of argument, we will accept your wild story. Now tell us how you propose to emulate your ancient namesake and bring this mass of iron down from the Heavens."

The critical moment had come, the moment which would spell failure or success. For an instant Ralph hesitated and when he spoke, he made no immediate reply to Kanzo Singh's satirical enquiry.

"Do the Three remember that when I came to the Ironmaster's meeting under the name of Ralph Morton, I ventured to suggest that science might provide a remedy for the fatal iron disease? At that time my suggestion was made without definite knowledge. The Three condemned it as heresy—contrary to the established belief that science was a thing complete, a body of wisdom handed down from the great men of the past.

"Since then I have dared to break with the traditions of centuries and sought to add to our knowledge of science, with the object of averting this world catastrophe. With the help of the All Wise and of my friend who calls himself Æsculapius, I have succeeded. It was he who told me of the Dark Star with its boundless stores of iron. Through an accident, I was enabled to solve the problem of rendering this iron available. I have visited the Rebels, those mysterious heretical scientists, in their City of Eternal Calm, and they have approved of my discovery. Let the Three discard their prejudices against scientific research and these Rebels will concentrate all their vast knowledge and resources upon carrying out my plan."

Hector Shawn's brow was like a thunderstorm, but his voice was low.

"Once we forgave your heresy, deeming that your youth excused you. This time there is no forgiveness, either for you or your companions. We will hear no more. You shall be imprisoned for life, lest your accursed beliefs, if indeed you really believe such a farago of nonsense, defile others."

Ralph sat back in his chair, stunned. How had he ever dared to nourish a hope that he could overcome the deep-rooted beliefs of the Three? But before he could gather himself for one last protest, the little Japanese doctor was on his feet.

"Servants of the World!" he cried. "We invoke the Law of the Triangle!"

"The Law of the Triangle is for all alike," responded Kanzo Singh, his voice dangerously smooth, "but I fail to see how it can be applied in this case."

"Hearken and learn!" declaimed the little Doctor and it seemed to Ralph that his stature increased until he towered above them all. " 'Equal opportunities to all and to each the full reward of his accomplishment.' That is the base of the Triangle! In every age the World has forged its own chains, the chains which have fettered the limbs of the Race and held it back on the pathway of infinite progress. In past ages men were tied down by stupid social and religious conventions. Today we have shaken off these conventions, only to replace them with the equally ridiculous and cruel bonds of Scientific Prejudice.

"What are the Three that they should dare to limit the boundaries of the Truth? Would you usurp the throne of the All Wise and say to mankind, 'Thus far shalt thou go and no further!'? It was not alone material things of which David Windsor spoke when he gave us the Law of the Triangle. In the name of the Rebels we demand those equal opportunities to all which the Law provides; equal opportunities in thought and belief as well as in deed.

"Servants of the World, you stand at the parting of the ways. Cast aside your worthless prejudices against science and men will bless you as the forerunners of an era of progress such as you cannot dream of. Refuse to listen to our demands, and generations to come will curse the names of Hector Shawn, Kanzo Singh and Felice Mincheau, who condemned them to centuries of labor and poverty rather than give up one iota of their narrow, hidebound beliefs. I have spoken! Let the Three answer, if they can!"

DURING this tirade, Ralph had sat with downcast eyes and clenched hands, powerless to interrupt the torrent of words which he felt was only serving to seal their fate. When he ventured to look up, it was to find no sign of the storm which he anticipated. The thunder cloud had passed away from Hector Shawn's brow, there was an expression of benignancy on Kanzo Singh's austere features, and Felice Mincheau was smiling.

It was not the custom of the Three to confer in the presence of others. The Age of Social Enlightenment had produced a spirit of mutual understanding which had largely done away with the endless bickering and wrangling of legislators in the past. In the Three, constantly associated for ten years, this spirit found its highest expression in a species of telepathy which made discussion unnecessary.

When Felice Mincheau spoke, therefore, it was with authority, knowing that she voiced the opinions of her associates.

"The Three loves courage," she said, softly, "and rewards courage even though it may be the outcome of misguided enthusiasm. Let the young man, Prometheus, tell us his plan. We will hear him because he and his friends are brave, not because our minds are swayed

by what the old man Æsculapius has cast in our teeth. Are the Three in accord?"

Quietly and without heroics, Ralph told the story of the Hanging Workshop in the Rockies. He told how he and Geoffrey Von Elmar had isolated themselves from their fellow men because of their firm conviction that the time was at hand for science to resume her upward march. He spoke of the coming of Dr. Ota Umetaro and described the rescue of Lotus from the bergschrund in the glacier. Passing over the dramatic advent of Kana, he spoke of the discovery of florium.

"Centuries ago," he went on, "wise men found that all things were divisible into certain elementary substances. It is true that later it was found that all these elements are the result of atomic groupings of electrons, but it is none the less true that the arrangements of the electrons are governed by a progressive law. In geometry, we subdivide plane figures into triangles, squares, pentagons, hexagons, according to the number of their sides, although all are bounded by the same straight lines. In a similar way the elements follow one another according to the complexity of their structure.

"At the close of the scientific era, there was one element in the series which had not been isolated. It is this element which my friends and I have discovered and have named florium. It is this element whose extraordinary properties will make accessible the boundless stores of iron in the Dark Star. What these properties are, I will now demonstrate."

Taking the case which Kana had brought, he opened it and produced a light metal tripod. Having erected this in an open space, he clamped the little bar of florium to the top. As the new element shed its weird violet radiance over the scene, even the Three were stirred to expressions of admiration.

Ralph handed to Kana a ball of iron, weighing perhaps ten pounds. The Negro walked away to a distance of a hundred yards and placed the iron globe upon the ground. In the meantime, Ralph took a piece of insulated wire and having wound it two or three times around the florium bar, he attached the ends to the terminals of a tiny electric battery.

"Watch the iron ball!" he said.

For several seconds nothing happened. Then it stirred, hesitated, started to roll towards them. Moving very slowly at first, it gathered speed. At a distance of about ten yards from the tripod, the ball left the ground and soaring upward in a graceful curve, struck the end of the florium bar, where it hung quivering, like an orange stuck on the point of a needle! Ralph disconnected a wire from the battery and the iron ball fell to the ground.

The Three gazed wonderingly from Ralph to the glowing bar of florium.

"We have seen your demonstration, friend Prometheus," said Shawn, a new respect in his deep voice. "Tell us, what does it mean?"

"It means that in florium we have a metal whose magnetic properties are so much in excess of anything previously known, that so far we have been unable to measure it. When a current of electricity passes through a coil of wire, a magnetic force, known as a 'field,' is produced. The strength of this field is dependent upon a property of the substance which occupies the interior of the coil. This property is called 'permeability' which may be defined as the susceptibility of a substance to magnetization. The permeability of air is taken as unity, that of iron may run as high as several thousands, meaning that with a certain current running through a coil, the presence of an iron core in the coil will increase the strength of the magnetic field several thousand times.

"Florium possesses a permeability which can be measured only in billions. It also has a tendency to crystallize in long fibres, something like asbestos. The magnetic lines of force are parallel to these fibres, so that it appears to issue from the ends of a bar in the form of a narrow ray, instead of spreading in a fan, as in the case of iron.

"Beneath the glacier is a great bed of florium ore. We propose to excavate this ore, reduce it to the metallic state and erect a great tower of florium. We will surround this tower with copper cables, through which will pass the current from huge generators, thus converting the tower into a gigantic electro-magnet of inconceivable power. When the Dark Star passes across the zenith, the current will be turned on. Thus, little by little, our tiny satellite will be drawn from its orbit until it finally comes to rest upon the surface of the earth. So shall the Dark Star attain its final destiny, to serve the needs of mankind for centuries to come!"

Upon the faces of the Three, amazement was mingled with doubt. From the very dawn of astronomy men had dreamed of interplanetary flight, but here was a man who calmly proposed to reach out and pluck a star from its orbit and carve it into fragments to house and clothe the peoples of the world! Small wonder that the Three, versed as they were in the wisdom of the ages, hesitated to believe the possibility of so fantastic a scheme!

THE pause was broken by Kana. He rose and stood before the Three, his mighty arms stretched above his head, his eyes rolled up until hardly more than the whites were visible.

"Hearken! Hearken unto Kana, the black man," he cried. "Hearken unto Kana who speaks the truth; Kana, who, like Enceladus, was buried beneath a mountain of evil. These, my friends, have removed the mountain and Kana is free. For this Kana owes a debt. Now, it comes into Kana's mind that he will be called upon to pay that debt, yea, before yonder Dark Star has sunk below the horizon. Therefore, hearken, for when Kana has spoken, he will speak no more!

"Think well, O Three, before you reject the help we have come to offer, for if, in your blindness, you say: 'Science! We will have none of it!' there are others whose sight is keener than yours, who will use this same science to destroy you. Clifford Weatherby, he whom you have banished, he whom once I called The Master, even now plots to hurl you from your seats and reign alone as Emperor of the World. Twice already he has sought to slay my friends, lest they rescue the World from his grasp.

"Know, O Three, that the disease which has destroyed your iron mines was not an accident. It was Weatherby's chemists who discovered the disease. It was Weatherby's tools, of whom I was one, who planted the germs in the shafts and tunnels. It was Weatherby's agents who poisoned the untainted ore which you had saved.

"Weatherby's mine alone escaped. There alone in all the earth, was the ore untainted. To Weatherby, the possession of this mine meant wealth and power beyond the dreams of avarice. He planned to wait until the Three were in despair and then to come forward as the saviour of the world. Borne upward on a wave of popular approval, he hoped to be enthroned as Supreme Lord of the Earth.

"But Kana, the slave he despised, has foiled his plot. One night, when his friends were sleeping, he left the workshop in the mountains and flew to the Weatherby Mine. Creeping past the guards, he dropped pieces of the diseased ore into the shafts. Today, the last iron deposit on earth has been wiped out.

"Weatherby's hopes are crushed, but his insane hatred and desire for revenge have risen from the ashes of his baffled ambition. Now, now he is plotting to destroy you all! Even now, perchance, he hears Kana's voice and Kana tells him that his time is at hand. Not the Phoenix of revenge and evil shall rise from the flames of Clifford Weatherby's ambitions, but the soaring Eagle of Science reborn; reborn to lead the world to infinite heights of knowledge and happiness.

"It is enough! Kana has spoken!"

With clenched teeth and glaring eyes, the Negro stumbled to his chair and sank down shuddering, his face buried in his hands.

"Friends," said Hector Shawn, and some of Kana's emotion echoed in his deep voice, "tonight we have seen and heard strange, well-nigh incredible things. If indeed this man who calls himself Kana speaks the truth, it seems that the All Wise has given us a new command and that the time has come for change.

"Now we will sleep. Tsen Sheng will see to your comfort in all things. Tomorrow, at ten o'clock, the Board of Control will meet and decide. Tsen Sheng will bring you to hear the decision. I have spoken. Are the Three in accord?"

The Three rose, made the Sign of the Triangle, and bowed courteously. The Audience was at an end.

The three friends had done what they could. Success or failure lay in the hands of the All Wise. Yet (so strange and wonderful are His ways), one more incident was to mark the close of that eventful day and determine the outcome of the whole matter.

As they left the Three, Ralph was a little ahead, followed closely by Kana, carrying the case of apparatus. Dr. Umetaro came last. In this order they approached the entrance to the grove, which was marked by two great palms, like the huge, natural pillars of a gateway.

Just as Ralph was about to step between these trees, he was startled by an exclamation from Kana. Next moment he was flung back by a sweep of a mighty arm. Burdened by the heavy metal case and overbalanced by his sudden movement, the Negro stumbled and fell forward into the shadows directly between the palm trees. As he staggered back, Ralph was dimly conscious of a flash, like a filament of crimson fire. There was a hideous shriek of mortal agony.

Then, darkness and silence.

A beam of light from Dr. Umetaro's pocket flashlight stabbed the gloom. It rested upon the body of Kana, lying with outspread arms. There was something unnatural in the posture of that still figure. With a thrill of uncontrollable horror, Ralph realized that Kana's head was lying apart from his body, severed as though by the sweep of a razor-sharp sword!

It was the Doctor who restrained Ralph from rushing forward. The Japanese raised the beam of his flashlight and the mechanism which had wrought Kana's death stood revealed in all its hideous simplicity.

A fine, metallic wire had been stretched between the trees about five feet from the ground. At one end, the wire was attached to a tiny switch in such a way that the slightest pressure on any part of the wire would close the contact. Current was supplied to the wire by means of a battery, hidden in the grass.

What mysterious instinct apprised Kana of danger, no one will ever know, for the wire was quite invisible in the darkness. Suffice it that he felt the presence of some evil which threatened the man he worshipped. As he fell, his throat encountered the wire and closed the switch. In an instant, the metal thread was heated to incandescence by the passage of the current.

Kana had paid his debt!

With a jerk, the Doctor broke the connections from the battery and tore off the fatal wire, sticky with the life-blood of a brave man. He turned to the Three, who, drawn by Kana's death cry, were standing in silent awe in the presence of death, and pointing at the headless body—

"Clifford Weatherby's work!" he said. "Servants of the World, did Kana speak the truth?"

CHAPTER XV

The Oath of the Three

THERE is no more lovely spot in the Antilles, if indeed in all the world, than the island of Santa Lucia. There is no more beautiful structure, even to this day, than the Temple of the Triangle, the building in which the Board of Control gathers to consult and decide the destiny of a planet.

As its name implies, the Temple is three-sided. There are no walls, simply double rows of spirally fluted pillars, ivory and crimson ferrolith alternating. The capitals are united by a marvelously wrought entablature, the design of which is rendered singularly attractive by its variety. To one versed in history, this lack of uniformity is deeply significant, for each section of the frieze was the contribution of one of the old nations, and the whole is symbolic of that merging of national identity into one great world building which ushered in the age of Social Enlightenment.

No roof surmounts the cornice, but filmy, semi-translucent awnings can be draped between the pillars partially to shield the open court below from the intense rays of the tropical sun.

The floor is of polychromatic ferrolith, the infinite variety of colors interwoven, not in geometric tiles or irregular fragments like mosaic, but blending like the rainbow hues of a soap bubble at the point of bursting, or of a drop of oil which spreads upon the smooth surface of a pool.

On the morning following the tragic death of Kana, each member of the Board of Control was in thon* place in the Temple, long before the hour set by the Three for the meeting. A tingling spirit of unrest seemed to pervade the assemblage, as though in anticipation of some unusual revelation from the presiding officers.

If some human being from an earlier age could have gazed into the future and seen these men and women, members of the sole governing body of the World in the year 2200, how strangely they would have contrasted with the parliaments and senates with which he was familiar! In those days, the principal legislature of even a small nation comprised several hundred lawgivers, chosen from their fellows by a process which might well be called "the survival of the unfittest," as a twig is washed ashore by the heaving waters of a muddy, turbulent torrent.

The Board of Control in the Twenty-third Century numbered thirty-four. In no sense were they "representatives." All came voluntarily, because they felt that they had some message of helpfulness. All were equally welcomed. All had a voice in the discussions.

Yet, there were discussions, but no "debates." The passionate, party-ridden altercations of the old days were replaced by the calm, unbiased intercourse of friends, to which each brought thon contribution, as knowledge or wisdom prompted. Let the outcome be what it might, so that it advanced the happiness of mankind! When all had spoken, there was nothing even faintly resembling the "vote." One of the Three

*An old word, obsolete in the 20th Century, but revived later, meaning "his or her."

summed up the pros and cons of the matter under discussion and rendered the decision of "The Three in Accord." None ever dreamed of questioning these decisions, not because the Three possessed any special supreme authority, but because the sense of justice and logic had become so universal that the decision of the Three invariably coincided with the opinions of all the members of the Board. It was simply a matter of obtaining all the available facts. The outcome was a certainty, just as the result of an algebraic formula is the same, no matter what mathematician performs the calculation.

At the stroke of ten, the Three, headed by Hector Shawn, entered the Temple and advanced to the centre of the pavement.

"Your wish, my friends," greeted Shawn, raising his hand in salutation as the company rose. The Three parted, each taking a place in one of the angles of the floor, Shawn in the North, Kanzo Singh in the Southeast and Felice Mincheau in the Southwest. Ralph and Dr. Umetaro, who had entered quietly in the wake of the Three, seated themselves in the background and prepared to listen with as much patience as they could muster.

It was the French woman, Felice Mincheau, who rose to speak, and at first Ralph was puzzled to trace any connection between her words and his errand.

"Many years ago, my friends," she began, simply, "three men stood upon this spot and created a new world. Now, the creation of a world may be a simple thing to the All Wise, but to three very human men like Walter Ballantyne, George Windsor and José Pascano, the process involved labor and agony, the sweat of the brow and the sweat of the brain.

"Nevertheless, all went well, for they had a message and the world was ready to receive it. I say that all went well, my friends, but they encountered one enemy who, like Apollyon, came very near to frustrating their best plans and casting them down into the Valley of Humiliation. That enemy was science!

"Men once regarded science as the Fairy Princess, the good angel leading men onward to an earthly Paradise, but in the early Twentieth Century, just previous to the time of which I speak, science had prostituted herself to Mars, the God of War. The offspring of that bestial union was a brood of devils and demons such as Dante never dreamed of. Clouds of poisonous gases enveloped hundreds of young men, some of whom coughed out their lives in agony, some survived in misery. High power explosives were dropped from crude airplanes into groups of little children at play, rending them limb from limb, and spattering their innocent blood on the tear-stained cheeks of their wailing mothers.

"I could continue indefinitely depicting the horrors of scientific war. In the Middle Ages, war may justly be said to have possessed a certain glamour. We can find in our hearts to forgive the needless slaughter for the sake of the thrill which attended hand-to-hand combat, a thrill which we today can only guess at. But when science joined forces with war, the battlefield became a shambles. Men were butchered in exactly the same cold, unemotional spirit as cattle were killed by our carnivorous ancestors.

"In those dark days, the days of the Last Great War, two words, now obsolete, were on all lips;—"camouflage" and "propaganda." The former meant concealment by means of trickery or disguise; the latter, the art of training men's minds in false beliefs. These three men, Windsor, Ballantyne and Pascano, faced with the problem of shackling the activities of a Frankenstein's monster decided upon the use of camouflage and propaganda. They cut the Gordian knot by saying, in effect: 'Science has eschewed good and sought after evil. We will have none of it.'

"IT WAS Ballantyne, the scientist, who suggested the plan which was to fetter the science he loved, for two hundred years. This plan was nothing less than to create an artificial veil of mystery, similar to the fog with which the priests of old surrounded religion. The theory we know as the Orthodox Body of Scientific Beliefs was also Ballantyne's work and the Three took a solemn oath to carry on an intensive propaganda to the end that the world might accept this false doctrine as a religious tenet. For it *is* a false doctrine, my friends; the greatest lie that has ever been foisted upon the credulous human race!"

There was an uneasy movement and a subdued murmur amongst the listeners, as when the first breath of an approaching storm ruffles the surface of a placid lake. Covert, half-ashamed glances passed from one to another. From childhood they had been taught that the one and only test of scientific truth was the sacred books of the wise men of old. Now this woman, with her quiet, confident voice, was pulling down around their ears the structure of their most cherished beliefs.

If Felice Mincheau was conscious of the agitation her words produced, she gave no evidence of the fact.

"From that day, my friends," she went on, "the secret Oath of the Three has been passed on from decade to decade. As time went on, a new generation arose to whom the Orthodox Body of Scientific Beliefs was a part of the world they lived in. They breathed it with the breath of life; they drank it with their mother's milk. It never entered into their minds to question the absurd doctrine. The need for propaganda had passed, but still each Three, when they assumed office, took the Oath.

"My friends, the time has come to proclaim the truth. In this happy age, the danger which threatened the world in the days of Walter Ballantyne no longer exists. No longer will men turn the wisdom of the scientists to the destruction of their fellows. From this hour, science, purified and chastened by two centuries of imprisonment, is free to go forward, leading the world to infinite heights of knowledge and happiness.

"Would you know what has occurred to cause the Three to break their oath? I will tell you."

Very simply, she told the story of Ralph Morton's devotion to science. She spoke of the Rebels, living in seclusion and passing on the torch of learning from hand to hand through the generations. She told of Ralph's fortunate discovery of florium and of his plan to capture the Dark Star and save the world from economic chaos. Finally she described Clifford Weatherby's hellish plot to reduce the human race to virtual slavery, and Kana's death for the sake of the men who had, as he believed, saved his soul from the evil influence of his Master.

"It is to this young man," she continued, "who refused to be fettered by the conventions of the world, to him and to his friends, that science owes her release. Prometheus, come forward, that the Three may thank you for what you have done!"

Hesitatingly, his face revealing the stunned amazement with which he had heard Felice Mincheau's astounding revelation, Ralph Morton advanced to the center of the Temple. He looked around him, bracing himself to meet the horror and hatred which has ever been the guerdon of the heretic, the man who dared to think for himself. Instead, he found himself encircled by kindly, smiling faces. In place of the storm he had anticipated, there was joy and sunshine.

One cannot measure the mind of man with a worn-out, discarded yardstick. These people of the Twenty-

third Century were inured to change. They were accustomed to welcome with open arms any social transformation which was for the betterment of mankind. Their unfailing sense of logic enabled them to comprehend the great need which had prompted the original Three to take their Oath and pass it on to their successors. Now, they felt no anger such as men in the old days would have felt at the overthrowing of a lifelong belief. Instead, they rejoiced that new vistas of infinite promise had been opened for the delectation of men and women, and they honored this young man through whom the opportunity had come.

Suddenly, the pause which had greeted Ralph Morton's appearance was broken by a movement from one side of the Temple, where a little group of spectators and visitors was seated. A slim, girlish figure in crimson and gold, flashed across the floor and with a cry of "Raoul!" flung itself into Ralph's arms and began kissing him enthusiastically.

A tall, grey-haired man followed the girl, with more sedate steps, and clasped Ralph's hand in his own.

"Thank the All Wise, you have come back, Ralph!" the old man exclaimed, his voice broken with emotion.

"My friend," came the deep tones of Hector Shawn, "what is the meaning of this demonstration? Do you know this young man?"

"It means," replied the grey-haired man, his face wet with tears of happiness, "It means that your Prometheus is my son, Ralph Ballantyne!"

CHAPTER XVI

Loose Threads

THE Age of Social Enlightenment is past. Rather we should say, it has been superseded, as childhood is displaced by adolescence, for it is hardly conceivable that we can ever return to the state of ignorance and superstition which prevailed in the Twentieth Century. Today, we are in the midst of a great period of interplanetary exploration and already the world has benefited immensely by intercourse with our friends, the Martians and the Venerians.

It is only a little over a hundred years since the events we have been describing transpired, but already they are losing their outlines in the mist of the past. To our young men and women, the name of Ralph Ballantyne is scarcely more than a name; the capture of the Dark Star and the Renaissance of Science, events which they read of in books but having as little vitality as the Battle of Waterloo or the overthrow of the last Martian Theocracy.

We have set ourselves the task of revitalizing those eventful days, to the end that the memory of Ralph Ballantyne as a living, breathing man, may not die and that our readers may realize something of the hopes and fears, the strengths and weaknesses which animated the young scientist and his friends.

Strictly speaking, this task is now accomplished. It remains to gather up the loose threads and weave them into a series of tapestries, each in itself a fragmentary picture, but uniting to round out and complete the story of Ralph Ballantyne.

THE first of these tableaux is set in the home of Kanzo Singh. The time is early afternoon, the afternoon of that day when Felice Mincheau made her remarkable speech. The Three are there, Ralph, Rose and their father, and, of course, the ubiquitous Dr. Ota Umetaro!

John Ballantyne is speaking and his words seem strangely out of keeping with the tense emotion which marked the climax in the Temple of the Triangle.

"I cannot for the life of me understand how Rose recognized you, Ralph," he is saying. "Quite aside from the natural changes incident to ten years of separation, I should never have known your nose! My dear boy, what on earth has happened to it?"

Ralph burst out laughing.

"John is referring to the fact that I had the misfortune to drop a large, hard rock on my unfortunate beak, during a mountaineering expedition," he explained to the Three. "My nose got the worst of the encounter. It was always a sore point with John; he thought it spoiled my beauty! The transformation is quite a simple matter, Dad."—John Ballantyne winces and then smiles at the familiar appellation—"When I first met the Doctor in Denver, he performed a small plastic operation, with the result that I have returned to you with a proboscis of truly classic charm!"

"You have told us of the finding of florium," says Hector Shawn, "but you have not told us how you came to discover its remarkable properties."

"I was testing the various physical reactions of the new metal," Ralph explains. "When I inserted the little rod into the coil of a permeameter, an instrument for measuring magnetic flux, I started a miniature cyclone. Every iron or steel object in the room tore loose from its moorings and started towards me! Fortunately, the sudden jerk on the florium bar broke the battery wires, otherwise, the Doctor would have found me buried under a heap of heavy hardware."

"You have spoken of the almost infinite permeability of florium," Kanzo Singh comments, doubtfully, but, unless I am mistaken, permeability is simply the ability of a substance to conduct magnetism. How is it possible to produce such a gigantic flow of force with a small current? It seems contrary to the law of the Conservation of Energy. In other words, how can you get from a magnet more than you put into it?"

"You are forgetting the element of time, Kanzo Singh," Ralph replies. "Magnetism is a force, a tension in the ether; not a continuous flow of energy. A trickle of water might, in time, fill a huge reservoir. The power of a magnetic field, or in other words, the pull of a magnet, depends upon the ability of the core to accumulate the lines of force from the encircling coil. Am I clear?"

"Perfectly, my friend," replies the Hindoo. "Your discovery, no matter what may be the ultimate result, is a marvelous thing. Nevertheless, the greater marvel is that you had the courage to cling to your ideals through all those lonely years before Dr. Umetaro came to join you."

"Oh! But I was not alone!" exclaims Ralph. "Indeed, I doubt very much if I could have stuck it out if I had not had the loving encouragement of my friend, Geoffrey Von Elmar."

As the words leave Ralph's lips, Rose Ballantyne starts from her chair with a choking cry.

"Ralph! Oh! Ralph, is it possible?" she gasps, her face deathly white. "Is Geoffrey alive and well?"

Now it is Ralph's turn to stare with amazement.

"Of course he's alive, Rose!" he says. "We shall see him tonight."

"Geoffrey, alive after all these years!" Rose murmurs, burying her face in her hands. "Oh! Don't you understand? He was the whole world to me and—I lost him!"

John Ballantyne gathers the sobbing girl into the circle of his arms and stands looking over her head at the others with eyes half defiant, half ashamed.

"I think there is an explanation long overdue," he says. "I quarreled with Von Elmar—no matter what about. He said bitter things to me—things which turned me from a man into a raging beast. Not know-

ing what I was doing, I picked up an old dagger which I kept on my desk for a paper knife. I struck him with all my strength. He made no attempt to defend himself. He stood there for a moment with the blood streaming from a ghastly wound in his face, his eyes filled with sorrow. I heard a sound and turned. Rose was standing in the door, looking at Geoffrey. Then she crumpled in a heap on the floor. I rushed to her. When I looked for Geoffrey again, he had gone. We never saw him again. I have greatly sinned, my friends. Thank the All Wise that He has given me the chance to right the wrong I did."

* * *

THE Crystal Chamber in the City of Eternal Calm. The many-hued light, pulsating faintly in the jewelled dome, illuminates but dimly the strained faces of the waiting Rebels. In the center of the floor stands a small pedestal, supporting a crystalline mass about the size of a man's head.

Seated around the pedestal are Lotus, Geoffrey and Frank Darwin. Each rests a hand upon the block of centrium, that strange substance which possesses the power to bring human minds into sympathy, no matter how great the distance separating them from one another. The face of Lotus Grenville, alone of all the assemblage, is radiant with hope; that of Darwin is grim and determined; alternate sunshine and shadows appear in Geoffrey's expression, as his eyes stray from one to the other of his companions.

Suddenly the tense silence is broken and the voice of Lotus is raised in a veritable paean of triumph.

"They are coming!" she cries, starting to her feet. "They are coming! Ralph is wearing the Pathfinder!"

"To the Entrance! They are coming!"

The passageways are crowded with a surging mass of men and women, hurrying to the foot of the great shaft. Dignity is forgotten. The acquired patience of two centuries is cast aside. The quietude of Eternal Calm is shattered by wild cries and muttered exclamations of mingled hope and fear.

All too slowly, the mile-high tube is extended until the expanding door opens above the surface of the sea. Yearning eyes strain upward to catch the first glimpse of the aerial ark which is bringing them deliverance. Swiftly as a falling moonbeam it comes, swooping down to settle as lightly as a wind-borne dandelion seed.

The panel slides open and a young girl steps out. For a moment she stands gazing around her wonderingly. Then her black eyes come to rest upon the scarred face of the man she loves.

"Geoffrey!" "Rose! My beloved!" and these two are clasped in an embrace which tells of the joyful reunion of long-parted lovers.

Others are leaving the silvery space-flier. There is a gasp of incredulous amazement as the giant figure of Hector Shawn appears, his arm around the shoulders of Ralph Ballantyne. Next comes Kanzo Singh with the little Doctor, whose slant eyes are puckered up in a beaming smile. And last come Felice and John Ballantyne, who clasps Geoffrey's free hand and says, huskily: "Forgive me, my friend!"

Ralph has eyes for Lotus alone and ears only for her whispered words of love. He is hardly conscious of the dead silence as Hector Shawn begins to speak.

"You sent a messenger to the Three, my friends; one who called himself Prometheus. The Three have brought him back to you, bearing a gift of which he will tell you—the gift of freedom.

"I am no prophet. Whether your Prometheus will succeed in his rash endeavor to bring down fire from Heaven, I cannot say; yet I venture to predict that the time is not far distant when Ralph Ballantyne will wear upon his tunic the three-colored triangle of power.

"Your associate, Dr. Umetaro, has shown us the marvels of the guiding jewel which enables you to find your way back to your City beneath the waves. You call yourselves 'The Rebels.' Henceforth, you shall be called 'The Pathfinders' and it shall be your privilege to lead the world to new heights of knowledge and attainment. Pathfinders, the Servants of the World salute you!

"I have spoken. Are the Three in accord?"

And the hands of Kanzo Singh and Felice Mincheau are raised in the formal gesture of assent.

The night is far spent before Ralph escapes from the rejoicing multitude and finds himself alone with Lotus.

"I knew you would succeed, my Lover!" he exclaims, proudly.

"I am not sure that failure would not have been more welcome than success at such a price," he rejoins, sadly.

"Poor Kana! He adored you, Ralph."

"Yes, poor Kana! Yet there is no question that his death awakened the Three to a realization of their duty."

They are silent for a space. Presently Lotus touches Ralph's cheek caressingly.

"Do you remember, Beloved, my strange feeling that I had seen Geoffrey before? It all came back to me this evening when I saw him with Rose. I was staying with Rose at the Eyrie one summer—it must be five years ago. One evening we were walking in the gardens. Rose seemed distrait; her thoughts far away. Something—I don't know what made me look back. Through a gap in the shrubbery I caught a single glimpse of a face—a face marked with a hideous scar. It vanished before I could draw Rose's attention to it."

"So that is where Geoff went during his mysterious journeys," is Ralph's comment. "He used to go off in his plane and come back looking utterly worn out. I don't see why he thought it necessary to break off his relationship with Rose. Surely he didn't believe that her love depended upon his good looks!"

"You silly boy! How could he ask Rose to share his life when that scar on his face would be a constant reminder of your father's act?"

Ralph ponders over that for a few moments.

"Well—but—" he says, finally. "The Doctor has several times offered to remove the scar and Geoff always refused to have it touched."

Lotus smiles in her superior womanly wisdom.

"It wasn't the scar on Geoff's face that kept him away from Rose. It was the scar on your father's soul. That scar is healed now, thanks to my splendid lover!"

"No, my Flower," he replies. "Not thanks to me, but thanks to Kana."

* * *

THAT winter was a busy time for Ralph and his friends. The entire engineering personnel of the new-born Pathfinders devoted itself to solving the numerous technical problems involved in the great undertaking. The exact permeability of florium was determined by the physicists, while the astronomers measured anew the mass, orbit and period of the Dark Star.

By making use of these figures, the electrical engineers were enabled to calculate the various elements of the huge florium magnet with which they hoped to capture the tiny satellite. The length and diameter of the florium core, the ampere-turns of the copper winding, the nature and thickness of the insulation; all these things were matters of vast importance, if failure or even serious disaster were to be avoided.

It was not Ralph's intention to create a magnetic field of such strength that the Dark Star would instantly leave its orbit and fall upon the earth, even if such a thing had been possible. The lines of magnetic at-

Now it was not the steady, white radiance of the flood-lights, but a lurid, crimson coruscation in which the figure of Clifford Weatherby, one arm thrown across his eyes to shield them from the awful glare, stood out in detail.

traction would issue from the florium core in the form of two slightly divergent beams, one from each end. The direction and form of these beams being known, it would be a simple matter to turn on the current whenever the Dark Star came into range; that is to say, twice in each revolution.

Little by little, the fifty-mile ball of iron would be drawn nearer, moving faster in its orbit as it did so. Finally, when it had approached within a hundred miles of the surface, the full power of the magnet would be turned on. That would be the critical moment. Hurling along in its new orbit at the tremendous speed of ten thousand miles per hour, the Dark Star must be brought to rest instantly. There was no room for error. Once let the Star escape from the grip of the magnet and it would pursue its course around the world, leaving behind it a pathway of death and destruction.

Early May, a little over six months after Ralph's eventful visit to Santa Lucia, found him once more on the balcony of the Hanging Workshop in the mountains. With him were Lotus and Dr. Umetaro, besides a large number of scientists, gathered together to witness the first step towards their ambitious goal.

The silvery ribbon of the glacier shone in virgin purity under its unsullied robe of winter snow, though here and there crevasses were beginning to open and the air was filled with the tinkling of innumerable tiny streams. On the opposite side of the valley, close to the point where Geoffrey had rescued Ralph from the clutches of Kana, stood a small building, in front of which was a glittering structure like a huge searchlight.

Far away, below the glacier, was the great bergschrund in which Ralph and Lotus had first met. No sign of the chasm was visible under the universal mantle of white, but it did not need the pressure of Ralph's hand or the slightly regretful glance he gave, to remind her that their strange sub-glacial meeting place would soon be no more.

As they watched, a lurid ray darted from the searchlight on the cliffs and, after wavering uncertainly, came to rest upon the site of the bergschrund. The intense whiteness of the snow darkened, changed to dirty grey, and, more quickly than it can be told, a tiny, blue lake had formed. Swiftly the lakelet widened, sent out streams which merged into a rushing torrent of mingled snow and water.

The torrent spread over the surface of the ice until it filled the whole breadth of the valley and poured down over the tongue of the glacier in a raging cascade. Under the pitiless blaze of the heat-ray, a great pit was forming in the ice, a caldron filled with boiling water and fed by repeated avalanches which thundered down from the slopes below the pass, leaving a surface of grey, glistening rock.

Two hours later the glacier was a thing of the past. Its ice-polished bed, hidden for, the All Wise knows how many million years, stood bare to the light of day. Down the centre of the valley for a distance of over a mile, a violet band of florium ore lay revealed, fluorescing with a ghostly radiance, as the shadows of night gathered over the peaks.

Presently, a plane settled in the landing cradle and Rose and Geoffrey joined the group.

"Yes, it didn't take long to spoil our valley, did it?" Geoffrey regretted. "Congratulations on your ray-projector, Olaf Ericsson. It certainly came up to our expectations. Thanks for letting me handle it."

"I wouldn't worry too much about the destruction of your glacier, Von Elmar," observed the old scientist. "In a few years you will be able to observe the formation of a new one—a sight no human being has ever been privileged to witness. That ought to be some compensation."

"Lotus and I are leaving for the Pole tomorrow," Ralph announced. "I'll leave you in charge here, Geoffrey. Thanks to Ericsson's Ray Smelter, you won't find much difficulty in separating the metal."

"The ore bed is far more extensive than I had anticipated," Dr. Umetaro commented. "Judging by the outcrop, there must be millions of tons."

"I must admit that I was a bit worried lest the ore in the bergschrund should prove to be just a pocket," confessed Ralph. "Well, friends, shall we sleep? There's plenty of room, although I fear the accommodations are somewhat primitive."

* * *

A SITE had been chosen for the great magnet, close to the centre of the antarctic plateau. A circular pit in the ground was substituted for Ralph's original suggestion of a tower which was, upon more mature consideration, deemed impractical. With the aid of the Heat Ray, the ice was melted away over a considerable area, the resultant water passing away in the form of steam.

The Disintegrating Ray, of which Dr. Umetaro had spoken when the space flier was almost destroyed by Clifford Weatherby's depth bomb, was brought to bear upon the exposed rock, the atoms of which dissolved into their constituent electrons and simply ceased to exist.

In less than a week, a vertical shaft was dug, three thousand feet deep and fifty in diameter. At a distance of a hundred feet from the surface, a deep groove was cut in the sides of the shaft.

The next task was the construction of the winding. This consisted of a series of massive copper rings, split at one point and with the ends offset, something like the familiar "lock-washer." These rings were piled one upon another in the interior of the shaft, which they just fitted. The ends of the successive rings were brazed together to form a continuous helix. Insulation between adjacent rings was provided by means of a thick layer of spanelite, a synthetic substance invented by one of the Pathfinders. Insufer, the standard allotropic iron insulator, was no longer available in sufficient quantities.

The huge winding terminated just below the concentric groove and the lower end was brought to the surface through a small auxiliary shaft, bored for the purpose.

While this work was being carried on in the antarctic under Ralph's directions, Geoffrey's smelting operations were proceeding rapidly. Long before the winding was complete, shipments of florium bars began to arrive. These were stacked in the center of the hollow copper winding, care being taken that the crystalline fibres should run vertically. Like the winding, the florium core terminated below the groove in the walls of the shaft.

A series of steel bars was now installed above the completed magnet, to serve as reinforcement, and the remaining space filled with a mass of concrete a hundred feet thick, its lower edge locking into the groove.

"I don't quite understand the object of the concrete, Ralph," remarked Lotus, who was watching the immense mixers at work. "Why did you not bring the magnet to the surface? Won't the concrete interfere as an insulator with the lines of force, as you call them?"

"To answer your last question first, my Flower," Ralph replied, "there is no such thing as an insulator of magnetism, since magnetism is a strain, not a movement. Even the lower end of our magnet will act with equal strength, although the lines of force must pass

through the whole earth. Of course, the pull will be only about one-quarter as great in that direction, since the Dark Star is twice as far away."

"But why use the concrete at all, Ralph?" Lotus objected. "One would think you were trying to hold the magnet down!"

"That is exactly what we are doing, Sweetheart," he responded. "You must remember that the attraction between our magnet and the Star is mutual. If it were not for that block of concrete, locked into the solid rock, the florium core would shoot out of the winding, like a bullet from a gun, as soon as the current was turned on!"

The power plant to supply the energizing current presented a puzzling problem, since it was absolutely essential that it should be protected from injury at the moment of impact. This difficulty was solved by melting another pit in the ice at some distance from the magnet. Radio-controlled collectors were installed in this pit and connected to the magnet by means of copper cables running in channels in the ice. After the machinery had been enclosed in a watertight casing, the pit and channels were filled with water and allowed to freeze. After the magnet pit had been similarly treated, the antarctic ice presented once more an unbroken surface, no trace remaining of the elaborate mechanism which had cost so much labor and time to construct.

* * *

BUT in the meantime, what of the world at large? And what of Clifford Weatherby?

A passage from the editorial column of the Chicago *Tele-Journal*, a copy of which happened to come into the writer's possession recently, answers these questions more vividly than pages of dry description could possibly do. The paper is dated October 19, 2200—18 o'clock edition, two weeks after the meeting in Santa Lucia. After touching briefly on the pronouncement of the Three abolishing the Orthodox Body of Scientific Beliefs, the editor continues as follows:

"The Board of Control has every reason to be thankful that we live in the Twenty-third Century, not in the Twentieth. In those days, a Government which issued a proclamation declaring that the weather was not influenced by the changes of the moon, or that the act of walking under a ladder was a harmless procedure, would have been hooted out of office. Men's minds were a jumble of prejudices and superstitions, and woe betide anyone who dared to suggest that Reason was superior to Preconceived Opinion!

"Today, we are superior to such narrow beliefs. And yet, are we so very superior after all? Is it a matter for congratulation that for two hundred years we have allowed ourselves to be led astray by a fable which would hardly deceive a child—the Fable of Scientific Orthodoxy?

"The truth is that we were not deceived. In our hearts, we have never admitted that the scientists of the past 'knew it all.' We knew that the Three forbade scientific research; we trusted the judgment of the Board of Control and, as the simplest way out of a logical paradox, accepted the doctrine of Scientific Non-Progressiveness.

"The destruction of this doctrine has brought no upheaval, either mental or political. We are like children who, having tired of playing at Make-Believe, put away their toys and turn their attention to reality. The world is glad that a false dogma which it has never more than half believed, has been relegated forever to the dead past.

"That is our diagnosis of the general feeling with regard to the pronouncement from Santa Lucia, and our impression is confirmed by the ever-increasing flood of messages of congratulation and relief, which come pouring in to the Board of Control from every Division on the planet.

"Whether Ralph Ballantyne and his Pathfinders will succeed in their undertaking to capture the Dark Star, remains to be seen. Failure would not alter the fact that we stand at the foot of a mountain whose summit touches the heavens; the Mountain of Knowledge."

Further on, there is a brief news item, headed:

"Atavar Missing."

"A committee of the Board of Control visited the Weatherby Mines in Florida today. They found the place entirely deserted and the ore completely destroyed by the disease, the germs of which were planted by Wahkola Kana two months ago, in his successful attempt to foil the evil plans of his erstwhile Master. No trace was found of Clifford Weatherby, and it is believed that the Atavar may have taken his own life after his failure to kill Ralph Ballantyne by means of the Depth Bomb and the Incandescent Wire."

* * *

THE task was complete to the last detail, and the great florium magnet in its copper casing lay buried beneath the ice of the antarctic plateau.

On the first day of Sol, 2202, a great company of men and women was gathered in John Ballantyne's office, overlooking the Hudson River. It was late afternoon, but the room was in semi-darkness. At one end stood two large television screens, each displaying upon its surface a different picture.

The lefthand screen was a vision of utter desolation. A circle of hummocky ice, brilliantly illuminated by hidden floodlights, merged at the edges into Stygian darkness; the six-month darkness of the antarctic winter. Gusts of snow-laden wind howled in the outer gloom, burst through the barriers and scurried across the lighted circle, to be lost again in the blackness. The eerie hiss of the gale, distinctly audible in the silent room, gave an impression of such extreme realism that Lotus Grenville unconsciously shivered and drew her tunic closer around her.

In the centre of the picture, where the light was strongest, was a black circle, enclosing a sheet of ice as smooth as a skating rink. It marked the site of the florium magnet which crouched a thousand feet below, like some sulking monster, waiting for the signal to throw its invisible tentacles into space and seize its victim. Involuntarily, Ralph thought of the giant squid he had seen in the ocean depths.

The second screen showed the interior of a small, domed room, in which were seated two men. One of these, whose swarthy skin and refined features revealed his Maori blood, sat with his eyes glued to the lenses of a binocular telescope. The other was Dr. Umetaro. His hand rested upon the switch which would turn the current from a dozen of the world's largest transmitting stations, through the buried transformers and thence to the copper helix of the florium magnet. This must be done at the moment when the Dark Star entered the narrow field of attraction. The observatory had been erected for this purpose upon the summit of Mt. Cook, or Aorangi, the culminating peak of the New Zealand Alps.

The Doctor looked up from his intent watching of the chronometer upon the table and smiled.

"One minute to go, friends!" he said, quietly.

One minute to go and then—what? The hovering fingers of the little Japanese surgeon would fall and, in the act, would unleash forces of such magnitude that the solid earth might well be rent in fragments! A

kind of breathless horror descended upon the silent company as they looked through the screen into that fatal room, half a world away.

Thirty seconds more! Ralph's eyes seemed chained by invisible bonds to that waiting figure in the far-away observatory. His whole being was concentrated on those hovering yellow fingers. Dimly he was aware of a low humming noise which seemed to emanate from the other screen. Cloudily, in the borderland of vision, he was conscious of something that moved across the glaring circle of ice—moved and then was still.

With an effort of will, he tore his gaze away and looked. On the glassy ice, in the centre of the black circle, stood a tiny plane. The cabin door opened and a man stepped out and stood staring around him, as though bewildered. At first, he had his back towards the televisor, but after a moment, he turned and Ralph saw a cadaverous mask, distorted in a grimace of hate, and a puny fist raised in a gesture of furious anger. A cry of amazement burst from Ralph's lips.

"Clifford Weatherby!"

At the same instant, the Maori astronomer raised his hand and simultaneously Dr. Umetaro closed the switch. Immediately, the antarctic floodlights were extinguished and the screen was in darkness. Then came a dull, soundless thud, the tremor of a mighty planet as she stiffened her thews for a tug-of-war with her tiny, adopted satellite!

Startled by Ralph's cry, wondering faces were turned to his.

"It was Weatherby!" he exclaimed, in a hushed voice. "I saw him there—in the other screen—right over the pole of the magnet. He landed from a plane—alone. He stood there grinning and shaking his fist at the sky. Do you suppose he's—mad?"

Where had the would-be Emperor hidden himself after the collapse of his schemes? What wild notion had drawn him to that desolate spot at the very instant when the florium magnet leaped into life? Was he putting into force one last, desperate attempt to baffle his enemies or was he indeed, as Ralph suggested, mad?

Before these questions could be formed into words, the dark screen was lighted once more, but now it was not the steady, white radiance of the floodlights, but a lurid, crimson coruscation in which the figure of Clifford Weatherby, one arm thrown across his eyes to shield them from the intolerable glare, stood out in minutest detail.

The heavens were a blaze of rushing fires as countless thousands of meteorites, torn from their age-long courses by the urge of the mighty magnet, came pouring down the lines of force and flamed into incandescence at the friction of the atmosphere.

Hundreds of the larger aerolites won their way through the retarding barrier and beat upon the surface of the ice. The room was filled with dull roarings. For a few brief moments there was a glimpse of the unfortunate financier crouching, grovelling with upraised hands in an inferno of flame. Then, dense clouds of swirling steam enveloped him and mercilessly concealed the end.

* * *

IT was winter again—winter in New York, but midsummer at the South Pole, and once more John Ballantyne's office was filled with a great company.

Throughout the intervening months, at steadily decreasing intervals, the florium magnet had hurled forth its imperious message to the heavens. Day by day had come the reassuring news from the observatories of the world; news of an ever narrowing orbit, an ever accelerated orbital velocity, until now the Dark Star raced around the world in a period of little more than two hours, barely grazing the atmosphere in its mad flight. Today, a current of fourfold strength would be crowded into the mighty copper helix in the attempt to arrest that headlong flight—forever!

A new televisor had been installed upon the summit of an adjacent mountain, to replace the one destroyed by the constant bombardment of the meteorites. The screen displayed an ice-plain, lit by the oblique rays of the polar sun and extending to the horizon. In the middle distance was a conical black mound, a heap of meteoric iron, beneath which lay the ashes of Clifford Weatherby, and the crushed remnants of his plane.

The eyes of the watchers were fixed upon the northern horizon. Suddenly the shimmering border of the ice-field was cut by a convex arc of black. With appalling speed and overwhelming majesty, the Dark Star rose into view until its mighty orb filled half the sky, preceded by a sea of shadow which swept across the ice like a tangible thing.

Ralph's hand descended upon the switch. It seemed incredible that any power of human making could stay the onrush of that flying mountain, that hurtling sphere. Yet, there upon the screen, before their eyes, the path of the Dark Star swerved, changed from an ellipse into a superb parabola. Three trillion tons of iron, the core of a sun, plunged in its last fall a hundred miles through the air and quivered to rest upon the frozen plain.

The whole world trembled at that tremendous impact. Earthquakes, tidal waves and storms were experienced everywhere, but fortunately none was of sufficient magnitude to do serious damage, and, thanks to the fact that the event was anticipated, no lives were lost.

When the earth had ceased from her shuddering, Ralph Ballantyne rose up and stood with his arm around the woman he loved. There was triumph in his glance as he began to speak, but Lotus had no eyes save for her lover's face.

"Servants of the World, the Dark Star is yours," he said. "No longer need you mourn the destruction of the mines, for here is iron enough to supply mankind for a thousand years. My work is finished and at last I am free to follow the dictates of my heart.

"Therefore, I, Ralph, do take Lotus to be my Companion, for so long as it shall please the All Wise to grant."

So he kissed her.

L'Envoi

THE circling years have dealt kindly with Ralph Ballantyne, leaving his youth and enthusiasm untouched, while adding the dignity and wisdom and the poise of self-confidence which become him well. As he sits there in the northern apex of the Temple of the Triangle, he is the same Ralph we have known and yet different, for his face and manner bear the stamp of mature manhood.

Close beside him sits the Companion of his life, in her eyes the mystery and calm of summer seas, her hair still radiant with the gold of fruitful wheat-fields. At her feet, his head against her knee, is another Ralph—a boy of ten, with his father's clean-cut features and his mother's serene, dreaming eyes.

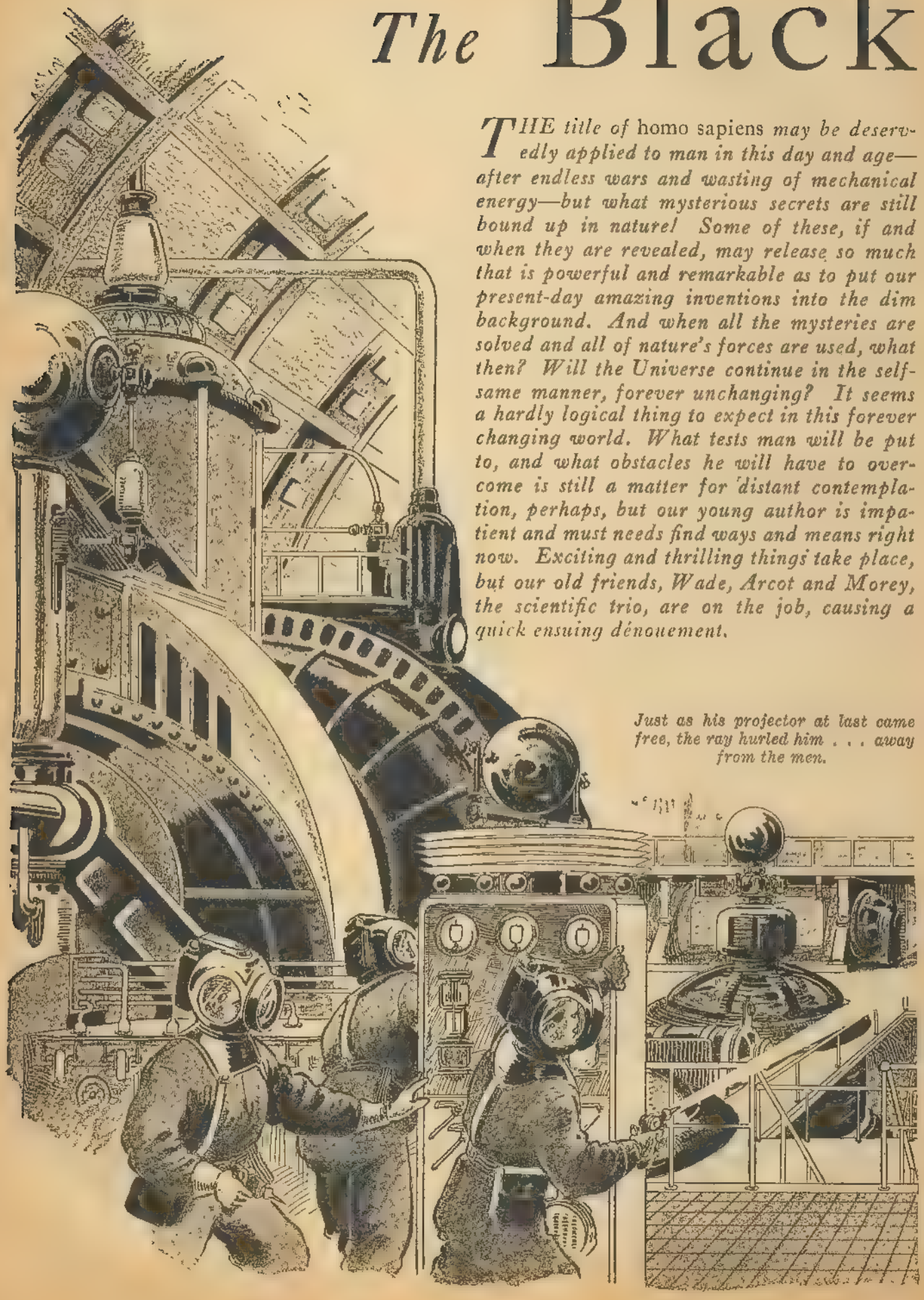
The Board of Control has been discussing the building of the first fleet of liners to ply between the Earth and Mars. This business concluded, Ralph rises and, with the sign of the Triangle and a resonant "Your wish, Friends!" dismisses the gathering.

Lotus slips her arm through Ralph's and leads him

(*Continued on page* 574)

The Black

THE title of homo sapiens *may be deservedly applied to man in this day and age—after endless wars and wasting of mechanical energy—but what mysterious secrets are still bound up in nature! Some of these, if and when they are revealed, may release so much that is powerful and remarkable as to put our present-day amazing inventions into the dim background. And when all the mysteries are solved and all of nature's forces are used, what then? Will the Universe continue in the self-same manner, forever unchanging? It seems a hardly logical thing to expect in this forever changing world. What tests man will be put to, and what obstacles he will have to overcome is still a matter for distant contemplation, perhaps, but our young author is impatient and must needs find ways and means right now. Exciting and thrilling things take place, but our old friends, Wade, Arcot and Morey, the scientific trio, are on the job, causing a quick ensuing dénouement.*

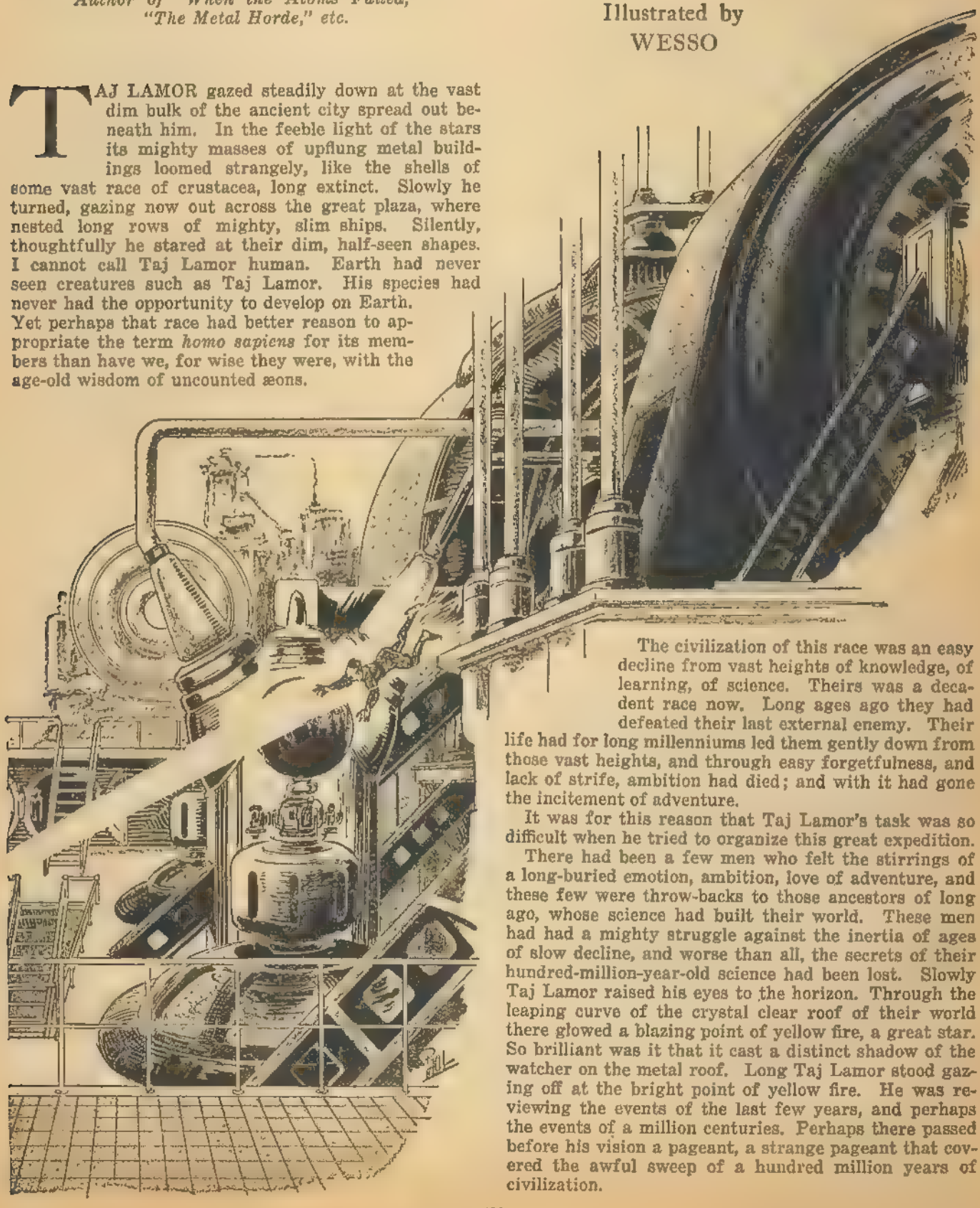


Just as his projector at last came free, the ray hurled him . . . away from the men.

Star Passes

By John W. Campbell, Jr.
Author of "When the Atoms Failed," "The Metal Horde," etc.

Illustrated by WESSO



TAJ LAMOR gazed steadily down at the vast dim bulk of the ancient city spread out beneath him. In the feeble light of the stars its mighty masses of upflung metal buildings loomed strangely, like the shells of some vast race of crustacea, long extinct. Slowly he turned, gazing now out across the great plaza, where nested long rows of mighty, slim ships. Silently, thoughtfully he stared at their dim, half-seen shapes. I cannot call Taj Lamor human. Earth had never seen creatures such as Taj Lamor. His species had never had the opportunity to develop on Earth. Yet perhaps that race had better reason to appropriate the term *homo sapiens* for its members than have we, for wise they were, with the age-old wisdom of uncounted æons.

The civilization of this race was an easy decline from vast heights of knowledge, of learning, of science. Theirs was a decadent race now. Long ages ago they had defeated their last external enemy. Their life had for long millenniums led them gently down from those vast heights, and through easy forgetfulness, and lack of strife, ambition had died; and with it had gone the incitement of adventure.

It was for this reason that Taj Lamor's task was so difficult when he tried to organize this great expedition.

There had been a few men who felt the stirrings of a long-buried emotion, ambition, love of adventure, and these few were throw-backs to those ancestors of long ago, whose science had built their world. These men had had a mighty struggle against the inertia of ages of slow decline, and worse than all, the secrets of their hundred-million-year-old science had been lost. Slowly Taj Lamor raised his eyes to the horizon. Through the leaping curve of the crystal clear roof of their world there glowed a blazing point of yellow fire, a great star. So brilliant was it that it cast a distinct shadow of the watcher on the metal roof. Long Taj Lamor stood gazing off at the bright point of yellow fire. He was reviewing the events of the last few years, and perhaps the events of a million centuries. Perhaps there passed before his vision a pageant, a strange pageant that covered the awful sweep of a hundred million years of civilization.

In the far, dim past, perhaps, he saw in space fifteen planets circling a small, red sun. On those planets there was no life. Only three were fit for life, but as yet the cosmic accident had not happened. Perhaps a million years passed before there crawled about on them the first beginnings of life. Then a hundred million years passed, and that first, crawling protoplasm had become a series of strange animals, plants and intermediate growths. Then more millions of years passed, and there appeared a creature that slowly gained ascendancy over the other struggling creatures that sought their places in the warm rays of the hot, red sun. That sun had been old, even as the ages of a star are counted, ere its planets had been born, and many, many millions of years had passed ere those planets cooled, and then more æons sped by before life appeared. Now, as life slowly forced its way upward, that sun was old and nearly burned out. Those animals fought, and bathed in the luxury of its rays, for many millenniums were required to produce any noticeable change in those life-giving radiations.

At last that one animal had gained ascendancy. It was the ruling genus. The last hundred million years had been entered upon now. The race of *homo sapiens* was rising to civilization.

Before the eyes of the thinker passes a long line of struggling, semi-barbaric people who fought among themselves. First came stone buildings, the beginnings of engineering. With them came little chemical engines that would destroy them; warfare was developing. Then came the first crude flying-machines, using clumsy, inefficient engines. Chemical engines! Engines that were so inefficient that one could watch the flow of their fuel! One part in one hundred thousand million of the energy of their fuels they released to run the engines, and they carried fuel in such vast quantities that they staggered under its load as they left the ground! The first mechanical flight! After it, though, there came other machines and other ages. Other scientists began to have visions of the realms beyond, and they sought to tap the vast reservoirs of Nature's energies, the energies of matter.

Other ages saw it done—a few thousand years later there passed out into space a fragile, delicate machine that forced its way out through the void, and across to another planet!

Swiftly now, science seemed to leap up on itself, building with ever faster steps, like some crystal which, once started, grows ever faster.

And while that science grew swiftly greater, other changes were taking place, changes in their universe itself. Ten million years had passed before the first of those changes became pronounced. But slowly, steadily their atmosphere was leaking into space. Through ages it was gradually apparent. Their world was losing its air and its water.

AGAIN science helped them. Their discovery of space-travel machines had enabled their civilization to meet the scarcity of metals, but now their air and water were going. Water they could import for a while, but still it was disappearing. They must find new sources, and even the other planets were well nigh exhausted of metals. But their ten-million-year-old science aided them once more.

Thousands of years before science had learned how to change the mass of matter into energy, but now at last the process had been reversed, they could change energy into matter, any kind of matter they wished. Rock they took, and changed it to energy, then that energy they transmuted to air, to water, to the necessary metals. Their planets took a new lease of life!

But even this could not continue forever. They must stop that loss of gas, for eventually the entire planets would slowly pass into the void. The process they had developed for reformation of matter admitted of a new use. Creation! They were now able to make elements, things that had never existed in nature! They designed atoms, as, long before, their fathers had designed molecules. But even so their problem was not solved, till at last a new form of matter was made. This was clearer than any crystal, and yet stronger, and tougher than any metal known. Passing any light or heat ray, they could roof their worlds with it and keep their air within!

This was a task that could not be done in a year, nor a decade, but when all time stretched out unending before them——.

Three planets of the fifteen were of a temperature adapted to life, and one by one these planets became vast, roofed-in cities. Only their titanic powers, their mighty machines made the task possible, but it was done.

Slow ages drifted on, and the pageant bore only a long tale of greater triumphs of science, and here and there came the story of awful wars in the void, when the population would be halved, and all space for a billion miles about would be a vast seething cauldron of battling ships and deadly rays. Forces were loosed on the planets that swung even their mighty masses loose in their orbits, and equal or greater forces were opposed, and the worlds rocked drunkenly in their orbits, pawns in the play of titanic forces that tore space itself with the awful play of its energies, and light was unable to pass through the distorted space.

Then came peaces, always futile. A few brief millenniums, then again the flame of war burst out, and space was again rocked with the warring of forces that dwarfed into insignificance the planets, and the stars, swinging them, helpless, in the grip of awful energies. But for each force an equal force appeared on the opposing side, and the worlds were readjusted. Yet at last they would end, and life would continue.

But slowly, slowly there crept upon the Pageant of Time a darkening cloud, a slow change that came so gradually no man could see it, but only the records of instruments, made over thousands of years, could show it. Their sun had changed from bright red to a deeper, duller, red, and ever less and less heat poured forth from its surface. Their sun was waning!

As its fires of life died down, the people of the wheeling worlds joined in a lasting bond; they must fight the great common menace, death from the cold of space.

LIKE people huddling close to the fire as the cold blasts begin to blow, these men of long ago drew their planets closer and closer to the dying sun. Other planets were habitable now, and these others were taken possession of, and mighty roofs of the clear material were thrown over them. Life went on beneath, and above the sun was dying.

A star cannot grow cool, but it becomes "closed," shutting in its floods of light and warmth with a blanket of intangible gravitation. A star that is burnt out cannot cool down; it lacks the terrific stores of energy needed to cool its substance, yet it lacks the energy to continue radiation. It cannot cool, yet it cannot give off any more energy as radiation. It must maintain itself at a terrific temperature in space, which seems to demand a high radiation. Too tired to stop working! Paradoxical that may seem to us, but to those people it was deadly fate. Their sun was dying and their worlds were freezing.

Within the heart of every star there is a vast furnace where matter is converted into energy. The mass

of matter is destroyed, and every gram of matter yields 900,000,000,000,000,000,000 ergs of energy, but this energy, radiated as light and heat, has all *the mass that the matter had!* That light has mass is easy to prove; it is easy to show its momentum, for it exerts a very definite pressure. However, the mass of light is so slight, to have a mass appreciably great so much light is required, that we cannot ordinarily detect that mass. We feel the heat first.

In those furnaces of the stars, matter is destroyed by heat. It is heated here to a temperature of 40,000,000 degrees centigrade. Such a temperature is incomprehensible in ordinary life, for temperature is the measure of the kinetic energy of the molecules that make up that body, but at that temperature no molecules can exist. They would be flying about at such terrific speed that their collisions would crush them. So violent are these collisions at this temperature that even the atoms are disrupted, and they are smashed, and the protons and electrons are separated. No other solar system could come nearer to ours than the orbit of Neptune—nearly three billion miles away from the sun—without disrupting the system. Similarly, no atom can come closer to its nearest neighbor than the orbit of its outermost electron. If this be knocked off, the atoms may approach more closely. This process of packing has been carried to the ultimate in the interior of stars, and the atoms are completely stripped of their electrons. Atoms so stripped can, of course, be packed very closely. When we consider how empty an atom of lead is, we can begin to appreciate the density these atoms could reach when so packed. In the center of any star these conditions are reached.

But now let us suppose that this star cools. What will happen to the atoms? The electrons, which have been stripped off, will at once fall back into their orbits, and the atom will again become its former bulky self, mostly empty space. As this happens, it must have more room. As it cools, it expands, and expands enormously.

As the center of a star expands, it must necessarily make room for itself by lifting out of its way the upper layers of the star. But these upper layers are, then, being lifted against gravity. Work is being done. It was our original hypothesis that the star, which was cooling, was already burnt out. It has not the energy to do this work of expansion.

THE gravitational attraction at the star's surface increases rapidly, till at last a new effect becomes pronounced. It has been pointed out that light has mass. Now, any light leaving the surface of the star must lift itself away against the immense gravitational attraction at the star's surface! The result is that a condition is reached when the star has become so "packed" that no light can leave it! We have at last a body which is exceedingly hot, yet cannot radiate!

Such a condition, the star of the system of Taj Lamor's ancestors had tended toward. Through long millions of years they had seen the life die out of their sun. Through those long years they had laid plans, and they had built their cities, had roofed in worlds, so that they might heat them artificially. They had built mighty heating plants, furnaces that burned matter, and warmed a world! Now all planets were alike habitable, and again the race expanded. They had at last reached a condition of stability, for never would, conditions change again, it seemed. All external heat and light they received came from the far-off stars of the galaxy, the three hundred thousand million flaming suns that would never fail them!

And now the pageant showed only a black star, with fifteen black planets circling it in awful, eternal night. A system from which no spark of light shone forth.

Yet now their advancement was not stopped. Steadily the race went on, progressing to their goal of all knowledge. They hoped that some day, somehow, they might escape these darkened, artificial worlds of theirs, but they knew that there was no hope, for the nearest star was over three and three-quarters light years off across the void.

So, hoping, they waited on their planets, while their scientists searched. Then, across the field of this pageant of a hundred million years of history, came scientist after scientist, and the people waited, and lived. They progressed, did the scientists, but the people merely waited. The scientists that came in these days seemed less brilliant than the old-time students, and many facts were forgotten, for the scientists of the race must come from the people and the people found it pleasant to wait. The world was unchanging, there was no strife, and no need of strife. There was no need to move—their worlds were warm, and pleasant, and safe. They were quite willing to wait.

And so the millenniums passed, and there were museums, and libraries, and laboratories, but there were no scientists worthy of the name. It was easier, and pleasanter to watch the machines of their ancestors do the work. So skillful, and so sure!

And so they had rested.

THEN came a scene in that pageant that seemed different. For there was Space, and the infinite glories of the stars, and there was one star that glowed brightly yellow off there in far space. The star was interesting. Curious ones who still knew the meaning of adventure, true throwbacks, men who had that Divine gift of curiosity that marks the genius from the sheep, went to the museums and looked carefully at the ancient directions for the use of the telectroscope, the mighty electrically amplified vision machine, and gazed through it. Now they saw a great sun that seemed to fill all the field of the apparatus with blazing fire. Here was a sun to envy! These men who still knew the meaning of curiosity, they wanted to be there, and they looked long at its brilliance, then turned the director a bit and saw that there circled about the sun a series of planets, seven they saw, but there were two that were doubtful, so small they were.

Taj Lamor had been with that group, a young man then, scarcely over forty, but they had found him a leader and they had followed him as he set about his investigation of the ancient manuscripts on astronomy.

How many, many hours had he studied those ancient books! How many times had he despaired of ever learning the truth of those ancient scientists, and gone out to the roof of the museum to stand in silent thought looking out across the awful void to the steady flame of the yellow star! Then quietly he had returned to his self-set task.

With him as teacher, others had learned, and before he was seventy there were many men who had become true scientists, astronomers. There was much that these men could not understand of the ancient works, for the science of a million centuries is not to be learned in a few brief decades, but there was much of the forgotten lore that they had relearned.

They knew now that that young, live sun, out there in space, was coming ever nearer to them, their combined velocities bringing the two bodies towards one another at over 100 miles each second. And they knew that there were not seven, but eight tiny planets circling about that sun. There were other facts they discovered; they found that the new sun was far larger than theirs had ever been; indeed it was a sun well

above average in size and brilliance. There were planets, a hot sun—a HOME! Could they get there?

When their ancestors had tried to solve the problem of escape they had concentrated their work on the problem of going at speeds greater than that of light. This should be an impossibility, but the fact that these men had tried it, seemed proof enough to their descendants that it was possible, at least in theory. They had needed greater speeds than that of light, for they must travel light years, but now this sun was coming toward them, and already was less than two hundred and fifty billion miles away! They would pass that other star in about seventy years now. That was scarcely more than a third of a man's lifetime. In that short time they must prepare to move!

The swift agitation for action had met with terrific resistance. They were satisfied, why move? And indifference is the most crushing form of resistance.

But, while some men devoted their time to arousing the people to help, others were doing the work that had not been done for many, many millenniums. The laboratories were reopened, and the pageant once more showed humming workshops as the different machines were tested. They were making things that were new once more, not merely copying old designs.

Their search had been divided into sections, search for weapons with which to defend themselves in case they were attacked, and search for the real principles of their space ships. They had the machines which they could imitate, but they did not understand them. The third section was less successful. They were also searching for the secrets of the apparatus their forefathers had used to swing the planets in their orbits, to move worlds about at will. They wanted to be able to take not only their space ships, but their planets as well, when they went to settle on these other worlds and in this other solar system.

Long years must be spent in erecting their cities, but if they could bring with them their old homes, they would have places to live in in the meantime. Through the ages their population had been dwindling. Fewer and fewer people had been born, until at last, there were but four of the original planets inhabited. These people must all be moved in the short period, while the two suns swung about each other, locked for a short while in the mighty embrace of their gravities. Could they move a world, it would be far easier.

But the search for this moving was unrewarded. The secret of the space-ships they learned readily, and Taj Lamor had designed these mighty ships below there from that knowledge. Their search for weapons had been satisfied, they had found one weapon, one of the deadliest that their ancestors had ever invented, but the one weapon in which they were most interested, the mighty force barrage that could swing a world in its flight through space, was lost. They could not find it.

They knew the principles of the driving apparatus of their ships, and it would seem but a matter of enlargement to drive a planet as a ship, but they knew that was impossible; the terrific forces needed would easily be produced by their apparatus, but there was no way to apply them to the planet. If applied in any spot, the planet would be torn asunder by the immense strain. They must apply the strain equally to the entire planet. Their problem was one of application of power. The rotation of the planet made it impossible to use a series of driving apparatus, even could these be anchored, but again the sheer immensity of the task made it impossible.

They were ready to start now on an expedition of exploration!

Taj Lamor gazed down again at the great ships in the plaza below. Their mighty bulks seemed to dwarf even the huge buildings about them. Yet these ships were his—for he had learned their secrets and designed them, and now he was to command them as they flew out across space in that flight to the distant star.

He turned, and stepped into a little torpedo-shaped car that rested on the metal roof behind him. A moment later the little ship rose, and then slanted smoothly down over the edge of the roof, to drop swiftly straight for the largest of the ships below. This was the flagship. Nearly a hundred feet greater was its diameter, and its mile and a quarter length of gleaming metal hull gave it nearly three hundred feet greater length than that of the ships of the line.

This expedition was an expedition of exploration. They were prepared to meet any conditions on that other world, no atmosphere, no water, no heat, or even an atmosphere of poisonous gases they could rectify, for their transmutation apparatus would permit them to change those gases, or modify them; they knew well how to supply heat, but they knew, too, that that sun would warm some of its planets sufficiently.

TAJ LAMOR was to lead this expedition, for he was their foremost scientist and their ablest citizen. He had designed these ships, and they had shown themselves a credit to their designer. Already many of them were in service gathering the materials of their world for transport. Now their great battle fleet of Space was ready to start.

Taj Lamor sent his little machine quickly toward a great door in the side of the gigantic interstellar ship and lowered it gently to the floor of the huge machine. Quickly a man stepped forward, opened the door for the leader, saluting quickly as he stepped out; then the car was run swiftly aside, to be placed with thousands of other cars like it. Each of these cars was to be used by a separate investigator, when they reached those other worlds, and there were men aboard who would use them.

Taj Lamor made his way to a door in the side of a great metal tube that threaded the length of the huge ship. Opening the door he sat down in a little torpedo-shaped metal car that shot swiftly forward as the double door shut softly, with a low hissing of escaping air. A moment and the car was shooting through the tube, then gently it slowed, and came to rest opposite another door. Again came the hissing of gas as the twin doors opened, and Taj Lamor stepped out, now well up in the nose of the titanic, interstellar cruiser. As he stepped out of the car the outer and inner doors closed, and, ready now for other calls, the car remained at this station. On a ship so long, some means of communication faster than walking was essential. This little pneumatic railway was the solution.

As Taj Lamor stepped out of the tube, a half-dozen men, who had been talking among themselves, snapped quickly to attention. Following the plans of the long-gone armies of their ancestors, the men of the expedition had been trained to strict discipline, with Taj Lamor the nominal Commander-in-Chief, although another man, Kornal Sorul, was their actual commander. Taj Lamor told them what he thought the best action; these other men put it into execution.

Taj Lamor proceeded at once to his Staff Cabin in the very nose of the great ship. Just above him there was another room, walled on all sides by that clear, glass-like material, the control cabin. Here the pilot sat, directing the motions of the mighty ship of space.

Taj Lamor pushed a small button on his desk and in a moment a grey disc before him suddenly glowed dimly, then flashed into sudden life and full, natural color. As though looking through a glass porthole, Taj Lamor saw the interior of the Communications Room. The Communications Officer was gazing at a similar disc in which Taj Lamor's features were imaged.

"Have they reported from Ohmur, Lorsand and Throlus, yet, Morlus Tal?" asked the commmander.

"They are reporting now, Taj Lamor, and we will be ready within two and one-half minutes. The plans are as before; we are to proceed directly toward the Yellow Star, meeting *en route?*"

"The plans are as before. Start as soon as you are ready, Morlus Tal."

The disc faded, the colors died, and it was grey again. Taj Lamor pulled another small lever on the little stand before him, and the disc changed, glowed, and was steady, and now he was watching the preparations of leaving, as from an eye on the top of the great ship. Men were streaming swiftly in ordered columns all about and into the great ships. In an incredibly short time they were in, and the great doors closed behind them. Suddenly there came a low, dull hum through the disc, and the sound mounted quickly, till all the world seemed humming to that dull note; they were ready to leave! The warning was sounding.

Suddenly the city around him seemed to blaze in a riot of colored light! The mighty towering bulks of the huge metal buildings were polished and bright, and now, as the millions of lights, every color of the spectrum, flashed over all the city from small machines in the air, on the ground, in windows, their great metal walls glistening with a wondrous riot of flowing color. Then there was a trembling through all the giant frame of the mighty ship. In a moment it was gone, and the titanic mass of glistening metal was rising smoothly, quickly to the great roof of their world above them. On an even keel the ship climbed straight up, then suddenly it leapt forward like some great bird of prey sighting its victim, and the great mass was darting swiftly forward. The ground beneath sped swiftly back, and behind them there came a long line of ships, a great mass of metal that swiftly formed behind them. They were heading toward the giant airlocks that would let them out into space. There was but one lock large enough to permit so huge a ship to pass out. They must go nearly half around their world to reach it. On three other worlds there were other giant ships racing thus to meet beyond their solar system. There were fifty ships coming from each planet; two hundred mighty ships in all made up this Armada of Space, two hundred gargantuan interstellar cruisers. These ships were intended as cargo and battleships. They were well adapted for this interstellar exploration.

On one small ship was a large white banner.

One by one the giant ships passed through the airlock and out into space. Here they quickly reformed as they moved off together, each ship falling into its place in the mighty cone formation, with the flagship of Taj Lamor at the head. On they rushed through space, their speed ever mounting. Each man seemed laboring under the load of three gravities and of four gravities as the ships flashed on at ever higher speeds. Taj Lamor watched his little speed indicator move across the dial. One hundred miles per second they attained before they passed out of the gravitational field of their little planet, and had gotten so far from their home, that its gravitation was negligible, and it was two hundred miles per second when they passed the orbit of the next outer planet. The pointer moved steadily on across the dial as the speed mounted ever higher. From two hundred to three hundred—then, before they left the outer bounds of their own system, the needle was wavering as it passed the 1,000 mark. Suddenly there seemed to leap out of nowhere another mass of shining machines that flew swiftly beside them. Like some strange, shining ghosts, these ships seemed to materialize instantly beside and behind their fleet. They fell in quickly in their allotted position behind the Flagship's squadron. One—two more fleets appeared thus suddenly in the dark, and together the ships were flashing on through space to their goal of glowing fire ahead!

A thousand—a million miles they traveled over—and Taj Lamor was standing quietly at the window of his Staff Cabin, looking steadily out at the growing sea of flame. Already it was visible as a disc of flame. They had left their planet scarcely an hour ago, but at their present rate of 7,000 miles each second, that meant twenty-five millions of miles.

Long the man stood gazing out through the window; then he turned, and walked slowly to the door, and started out to investigate the ship. He was not the commander now, but the scientist, the one designer and creator of this thing of power and speed and might.

HOUR after hour, day after day the ships flashed on through the awful void, the utter silence relieved by the communications between themselves and the slowly weakening communications from the far-off home.

But as those signals from home grew steadily weaker, the sun before them grew steadily larger. At last the men began to feel the heat of those rays, to realize the energy that mighty sea of flame poured forth into space, and steadily they watched it grow nearer.

Then came a day when they could make out clearly the dim bulk of a planet before them, and for long hours they slowed down the flying speed of the ships. They had mapped the system before them; there were eight planets of varying sizes, some on the near and some on the far side of the sun. There were but three on the near side, one that seemed the outermost of the planets, about 35,000 miles in diameter, was directly in their path, while there were two more much nearer the sun, about 100,000,000 and 70,000,000 miles distant from it, each about seven to eight thousand miles in diameter, but they were on opposite sides of the sun, one well to the west of the sun, and one well to the east. It was decided to split the expedition into two parts; one part was to go to the eastern planet, and one to the western planet. Taj Lamor was to lead his group of 100 machines to the western planet at once, for this outermost planet was not of immediate interest, for it revolved at a distance of nearly 3,000,000,000 miles from its sun, and its temperature could be but a few degrees above absolute zero. Their crystal roofs would have to come first ere life could be established on it, and these would require time to construct. These other, warmer planets, were of more immediate interest.

The great ships were slanting down over a mighty globe of water, it seemed. They were well in the northern hemisphere, and they had come near the planet first over a vast stretch of rolling ocean. These men had

looked in wonder at such vast quantities of the fluid. To them it was a precious liquid, that must be made artificially, and was to be conserved, yet here they saw such vast quantities of natural water as seemed impossible. Still, their ancient books had told of such things, and of other strange things, things that must have been wondrously beautiful, though they were so old now, these records, that they were regarded much as we would regard the stories of gods and goddesses walking on the Earth.

Yet here were the strange proofs! They saw great masses of fleecy water vapor, huge billowy things that seemed solid, but were blown lightly about in the wind. And natural air! The atmosphere extended for hundreds of miles off into space, and now, as they came closer to the surface of this world it was dense, and the sky above them was a beautiful blue, not black, even where there were no stars. The great sun, so brilliantly yellow when seen from space, was now a brilliant globe of reddish-yellow.

And, as they came near land, they looked in wonder at mighty masses of rock and soil that threw their shaggy heads high above the surrounding terrain, huge masses of solid soil that rose high, like waves in water, till they towered in solemn grandeur miles into the air! What a sight for these men of a world so old that age long erosion had washed away the last traces of hills, and filled in the last traces of the valleys!

In awe they looked down at the mighty rocky masses, as the titanic machines swung low over the mountains, gazing in wonder at the green masses of the vegetation, strange vegetation it was to them, for they had grown only mushroom-like cellulose products, and these mainly for ornament, for all their food was artificially made in huge factories.

Then they came over a little mountain lake, a body of water scarcely large enough to berth one of these huge ships, but high in the clear air of the mountains, fed by the eternal snows that thawed, and flowed down to it. It was a magnificent sapphire in a setting green as emerald, a sparkling lake of clear water, deep as the sea, high in a cleft in the mountains, the water of some long-melted glacier.

In wonder the men looked down at these strange sights. What a marvelous home! But they must forge steadily on now, they must find a place to land; then the men would be dispatched to investigate, and to map the world.

Steadily the great machines proceeded, and at last the end of the giant mountain was reached, and they came to a great plain. But that plain was strangely marked off with squares, as regular as though plotted with a draftsman's square. This world must be inhabited!

Suddenly Taj Lamor saw strange specks off on the far horizon to the south, specks that seemed to grow in size with terrific velocity; these must be ships, the ships of these people! They would defend their home. Now, in this moment, Taj Lamor must make his decision. Was he to withdraw and let these people alone, or was he to stand and fight for this world, this wonderfully beautiful home, a home that his race could live in for millions of years to come? He had debated this question many times before in his mind, and he had decided. There would never, never be another chance for his people to gain a new home. They must fight.

Swiftly Taj Lamor gave his orders. If resistance was offered, if any attack was made, they were to fight back at once, unhesitatingly.

The strangers' ships had grown swiftly larger to the eye, but still, though near now, they seemed too small to worry about. These giant interstellar cruisers were certainly invulnerable to ships so small; their mere size would give them protection! These ships were scarcely as long as the diameter of the smaller of the interstellar ships—a bare two hundred and fifty feet for the largest.

THE interstellar cruisers halted in their course, and waited for the little ships to draw near. They were fast, for they drew alongside quickly, and raced to the front of the flagship. There was one small one that was painted white, and on it there was a large white banner, flapping in the wind of its passage. The rest of the ships drew off as this came forward, and stopped, hanging motionless before the control room of the giant machine. There were men inside—three strange men—but they were gesturing now, motioning that the giant machine settle to the ground beneath. Taj Lamor was considering whether or not to thus parley with the strangers, when suddenly there leapt from it a beam of clear white—a beam that was directed toward the ground, then swung up toward the ship in a swift arc! In an instant there were a dozen swift leaping beams of pale red reaching out to that ship, and as they reached it, the ray that had been sweeping up to touch the ship, was suddenly still, and for an instant the ship hung still in the air; then it began to swing crazily, like the pendulum of a clock, and then it was swinging completely over—and with a sickening lurch it was speeding swiftly, and ever faster for the soil of the plain nearly five miles below. But in an instant it was over and there was a little crater in the soft soil. The ship had driven itself nearly twenty feet into the ground.

But the rays had not stopped with the little ship; they had reached rapidly out to the other machines, trying to reach them before they could bring those strange white rays to bear on them. Their cruisers must win, for they carried dozens of projectors, but they might be damaged; they might be forced to stay here. They must defeat those strangers quickly. The rays were lashing out swiftly, but almost before they had started, all the other ships, a hundred in all, were in action, and the flagship was darting swiftly up and away from the battle; their leader must be safe. Below, those pale red rays were taking a swift toll of the little ships, and nearly twenty of them rolled suddenly over, and dashed to destruction far below.

But now they were in swift darting motion. The little ships, through their small size, were able to avoid the rays of the larger interstellar cruisers, and as their torpedo-shaped hulls flashed quickly out of the way of the rays, they began to fight back. They had been taken utterly by surprise. They were a little late in entering the battle, but they evidently intended to make up for lost time, for the little fleet of thirty-five ships went into action with an abandon and swiftness that made the gigantic interstellar liners helpless through its very speed. They were in a dozen places at once, leaping as swiftly forward as sidewise or vertically. They dodged and twisted, unharmed, out of the way of the deadly red beams, and were as hard to hit as some dancing feather suspended over an air jet, except that here there was intelligent direction keeping them always in the least accessible places, and these pilots showed a positive genius in thinking up new ways of making their ships difficult targets.

And if the pilots were skillful in avoiding enemy rays, their ray men were as accurate in placing theirs. But then, with a target considerably larger than the proverbial barn door, not so much skill was necessary. They had only to touch those ships, and they began to realize that size did not make them invulnerable.

For these smaller vessels were the ships of Earth. The people of that dark star had entered our solar

system quite unannounced, except that they had been seen in passing the orbit of Mars, for a ship had been out there in space, going slowly, steadily out toward Neptune, and the great interstellar cruisers, flashing in across space, away from that frigid planet, had not seen the tiny wanderer, which was slowly climbing its long way across the two and three quarter billion miles from Earth to Neptune. But he had seen those mighty bulks, and had sent his message and warning out on the ether, racing the mighty machines in, and going at a speed nothing can exceed, and few things equal, and the radio message had been a warning to the men of Earth. They had relayed it to Venus, and the ships that had gone there had received an equally warm reception, and were even now finding their time fully occupied trying to beat off the Interplanetary Patrol.

These ships were Arcot Molecular Motion director ships, ships that drew their power from the heat energy of the air around them. Out in space they were slow, for there was no heat, but in the planetary atmosphere, they easily matched the speed of the Interstellar cruisers.

It was Arcot who had developed the principle of these machines not a full three years ago, and it was Arcot who had, with the aid of this principle, made the first interplanetary flight in the history of the solar system, going to Venus. The bonds of friendship between the two planets had grown swiftly in those three years, and they were already linked by many regular space lines. These ships made the trips as frequently as the relative positions of the planets permitted, but during the oppositions of the planets, when they were on opposite sides of the sun, they were necessarily discontinued.

The principle of these machines was simple in theory, but it had taken much work to bring it into practice. It had long been known that the molecules of any warm body were in rapid motion. In a gas the molecular motion amounted to several miles a second at times, and this speed was always relative to the speed of the mass of the body. Should the molecules of any body all start to move in the same direction, at the same time, the result is, of course, that the entire body is moving in this direction. Arcot had developed a peculiar high frequency field that caused all the molecules influenced by it to move in the same direction. This field actually converted the heat-energy of any body into mechanical energy, the energy of heat, the random motion of the individual molecule, was changed into the ordered motion of the mass, and the energy was applied as desired. It could be made to drive a ship forward by merely putting such an apparatus on the sides, filling a small tank with helium or hydrogen gas, since the molecules of these gases move the most rapidly for a given temperature, and to the copper tank attaching copper fins which carried heat very well. These fins would pick up heat from the air about. The molecules of the gas are all made to move toward the forward end of the tank, and there they are stopped by the mass of the ship, which resists this impulse. The molecules are then standing still relative to the ship. But motionless molecules have a definite physical significance; they mean that the body is at absolute zero, and any one who has worked with very cold liquids, such as liquid helium, or hydrogen, knows to his sorrow that these very cold substances will collect heat from the surrounding air at an amazing rate. The effect is the same in the case of the helium in the copper tank; it is solidified at once, since its molecules are motionless, and immediately it absorbs heat from the air, as solid helium always will. This heat makes the molecules move once more, and they are again promptly brought to a stop. Thus more energy is abstracted from the air, and the molecules are again started moving.

All this is repeated thousands of times a second, and the result is a steady hammering on the copper tank. This steady hammering is what we know as a gas pressure, and the pressure may easily amount to thousands of tons. The result is that the ship is rapidly put into motion, and the molecules tend to drive it ever faster. No matter how fast the ship goes, the molecules, in order to be "warm" must have a random motion of a certain number of feet per second. They will always want to go a little faster than the ship, so no matter what the speed of the ship, the acceleration will be constant.

The power obtainable from these power-units was surprising even to experienced engineers. They were, by the very nature of them, ideal for aircraft. They could be made perfectly streamlined. The discs, or fins, which served to give the copper tank a greater heat absorbing area, were made sharp as knives, and they cut through the air with scarcely any resistance. Other power units, mounted vertically, made it possible to hold the ship level in the air without wings. These same units, mounted laterally, gave the ship even greater flexibility.

ALL these features had been combined in the Interplanetary Patrol ships, ships designed to catch the speediest of the Air Pirates who had sprung up. These swift ships were easily capable of 5000 miles an hour, and at higher altitudes could make as high as 20,000 miles an hour.

The airplane was commercially non-existent now, for with the advent of these new ships, they had immediately displaced all machines using fuels. These ships used the absolutely free energy of the sun, as collected and stored by the Earth's atmosphere.

Planetary exploration had started almost as soon as the building of the first of the commercial molecular motion ships was completed, and the inventor of the device, Arcot, had, with his three friends, Wade, Morey, and Fuller, gone to the planet Venus. Their work there, the aid they rendered in saving the two great nations of Venus from destruction at the hands of a tyrannical ruler, had helped greatly to make friendships more secure.

Shortly after his return to Earth, other men in similar machines had undertaken the longer voyages to the other planets. The Moon had been examined at once, and the examination of Mars followed soon after, but the vast orbits of Jupiter, Saturn, Uranus and Neptune had made the trip so long, in the comparatively slow vehicles, that these planets had not yet been explored. In the depths of space it was hard to find the energy needed to drive their ships, and their progress against the gravity of the sun was correspondingly slow. Further, the orbital velocity of the planets themselves was so great, that it became a real race to catch up with them. Despite the fact that the "year" of Neptune is equal to nearly 170 of ours, the planet actually goes with terrific speed in its orbit. It is the vast extent of that orbit that makes the motion of the planet seem slow.

It was one of these interplanetary exploration expeditions that the people of the Black Star had encountered, and it was their warning that told Earth to be on the lookout.

Arcot, during his brief stay on Venus, had developed the most powerful weapon that man had ever seen in this system. He had found a means of projecting the molecular motion director field. This meant that anything touched by this projected field, or ray,

would move in a direction controlled by it, for every molecule of any matter it touched was immediately sent with all its velocity in whatever direction the operator wished. The result could be made either very constructive or very destructive. Imagine the ease with which a workman could float a beam of steel weighing, perhaps, twenty tons, up through the air, on its own heat energy—energy which it absorbed from the air—to place it where he wanted it. To do this he need only have a little pack on his back that contained the necessary apparatus, a pack weighing less than forty-eight pounds in the commercial apparatus, and a small hand projector. Again, imagine the same workman, wishing to remove a hillock in order to make a roadway. He need only direct the beam upon it, and the entire hill would suddenly start with all the energy of its quintillions of molecules, straight into the air, and fall, powdered, on the ground about its original site; or he could remove it in small chunks.

This was the commercial development.

Imagine, again, a man who is bent on destroying a great ship—perhaps an interstellar cruiser. He need only direct his ray against the nose of that ship, and send the bow, using the energy of its own molecules, crashing backwards. It will suddenly leap back upon the rear and midships portions of the huge machine, striking them as though driven by some immense hammer, weighing millions of tons, and moving several miles a second! The result is obvious—utter wreckage, a twisted mass of torn girders, broken plates, and bent beams. Nothing could resist it for the simple reason that, no matter how big it was, no matter how strong it was, it crushed itself with its own size and tore itself with its own strength. Size was no immunity against this weapon, as the people of the Black Star quickly learned. They received a most hearty reception and a great send-off!

The great interstellar ships were far too long, too clumsy to be maneuvered as easily as were their tiny opponents. They could only stand and receive. They found it most difficult to deliver even so much as a single blow, once those little machines got under way, for the interplanetary Patrolmen were skilled in ray dueling. Regular practice was held, using certain harmless rays to simulate the deadly molecular director ray. Once they realized the menace of these rays, they kept carefully out of their vicinity.

THE battle was brief, for Taj Lamor, in his machine high above, saw that they were outclassed, and ordered them to withdraw at once. Scarcely ten minutes had elapsed, yet they lost twenty-two of their giant ships in wreckages.

The expedition that had gone to Venus reported a similarly active greeting. It was decided at once that they should proceed cautiously to the other planets, to determine which were inhabited and which were not, and to determine the chemical and physical conditions on each.

The ships formed again out in space, the other side of the sun, however, and started at once in compact formation for Mercury.

Their observations were completed without further mishap, and they set out for their distant home, their number depleted by forty-one ships, for nineteen had fallen on Venus.

In the meantime the Terrestrian and Venerian governments were already preparing vigorously for further inroads. It was agreed at once that this was to be a war of science, and that the men they must call in were the scientists. These conclusions were reached at once, and agreements were immediately drawn up between the two worlds to join forces, and thus eliminate all unnecessary motions. It was obvious that they would need more ships. However, they must first have a scientific report on the ships that had fallen there in western Canada, for it might be that it was possible to find some ray or force that would make them helpless, and they might find also the secret of that death ray that they had met. They must first have the scientists investigate.

The first scientists they thought of were the men who had made possible this so successful resistance: Arcot and Morey and Wade. These men they knew would all be working in the Arcot Laboratories, and they called there at once. Arcot and his friends were to start for that battlefield at once.

"Wade—bring Morey and come on out to the machine on the roof at once—I'll be waiting—that was a call from Washington. I will explain as soon as you get there," called Arcot as he snapped the switch of the televisophone shut. He had answered the call, and given the reply in the name of the three.

On the roof Arcot at once moved the hangar doors open, and got into the five-passenger molecular-motion ship inside. The sleek, streamlined sides seemed to speak of power and speed. This special model was slightly faster than most machines, and as it was a research model, designed for their experiments, it carried many mechanisms that others did not, automatic controls that were being developed, among them. These had not yet reached a stage of practicability for the private machine, so there were none others in existence. They were still in the laboratory stage, but they admitted of higher speed, for no human being could control the ship as accurately as these.

It took them a little less than a quarter of an hour to make the 5,000-mile trip from New York to the battlefield of Canada. Arcot and his friends were passed through the lines at once, and they settled to the ground beside one of the huge ships that lay half buried in the soil. The force of the impact had splashed the solid soil as a stone wall will splash soft mud, and around the ship there was a little ridge of earth. Arcot looked at the titanic proportions of these ships from space, and turned to his friends:

"We can investigate that wreck on foot, but I think that it will be far more sensible to see what we can do with the car. That ship is certainly a mile or more long, and we would spend more time walking than in investigation. I suggest, therefore, that we see if there is not room enough for the car inside. That beats even those huge Kaxorian planes for size. I sure would have liked to mix it in the fight they must have had—nice little things to play with, aren't they?" grinned Arcot as they looked at the mighty bulk of glistening metal, twisted and distorted now, but still holding the lines of terrific power about it.

"It would make a nice playmate," agreed Wade as he looked at the rows of wicked-looking projectors along the sides of the metal hull, "and I wonder if there might not be more in there? If there are, the size of the ship would prevent them showing themselves very quickly, and since they can't move the ship, it seems to me that they will begin to be noticeable in a short time. Probably, with the engines stopped, their main rays are useless, but they would doubtless have hand weapons. I am highly in favor of entering the car. We carry a molecular director ray, so if the way is blocked, we can make a new one. Look over there—that ship is still flaming—it is a reddish flame—but almost colorless. It certainly looks like a gas flame, with a bit of calcium in it. That atmosphere looks almost as if it were combustible. If we should do any exploring in the ship, I suggest that we use altitude suits—they will be good in any case."

There were three or four of the great wrecks flaming now, evolving great long tongues of colorless, intensely hot flame. Several of the ships had been only slightly damaged; one had been brought down by a beam that had torn the entire tail of the ship free, leaving the bow in good condition. Apparently this machine had not fallen far; perhaps the pilot had maintained partial control of the ship, his power at last utterly failing when only a comparatively short distance from Earth. This was rather well to one side of the field, however, and we decided to investigate it later. Since the ships were scattered over an area perhaps twenty-five miles square, it meant a considerable trip to that other ship.

This ship had crashed nose first, and the nose had been utterly ruined, then the tail of the ship had fallen horizontally, after the lengthwise members gave way. The car was maneuvered cautiously into the great hole at the nose of the ship, and they entered the mighty vessel slowly. There were many heavy girders sticking out at odd angles, any one of which seemed quite capable of wrecking the little ship, so they turned on a powerful spotlight. It soon became evident that there was little to fear from any living enemies, and they proceeded more rapidly. Certainly no creature could live after the shock that had broken these huge girders! Several times huge beams blocked their path, and they were forced to use the molecular director beam to bend them out of the way.

"Man, but those beams do look as if they were built permanently! I would hate to ram the machine against one of them! We never would get through here on foot, and without this ray, we wouldn't get through here anyway. Look at that one—just see how it has bent—if that has anywhere near the strength of steel, just think of the force it took to do that!" said Arcot as they stopped a moment to clear away a huge member that was bent across their path. "But there it goes—its molecules are pulling it around. I hate to use this too freely, though—it may put some strain on another girder, and we may have the whole structure tumbling in on us!"

At last they had penetrated to the long tube that led through the length of the ship—the communication tube. This admitted the small ship easily, and they moved swiftly along till they came to what they believed to be about the center of the original ship. Here Arcot proposed that they step out and see what there was to be seen. As they had been the first party of scientists to arrive, they could only guess at what they would find.

"I don't know what we'll find, fellows, but I think the engines should be in about the center of the ship. The machine seems to have landed on one side rather than on its keel, and I suspect that the sudden shock has torn the engines loose, but we may find something of interest. There is what seems to be a doorway there. I suggest that we stop, leave the ship here, and enter on foot. We can wear altitude suits and carry our ray pistols."

The others agreed, and they at once put on their altitude suits, heavy rubberized canvas suits designed to be worn outside the ship when at high altitude, or even in space. They were supplied with oxygen tanks that would keep the wearer alive for about six hours. Unless the atmosphere of the ships was exceeding corrosive, the men would be safe.

They decided that if one was to go, they might as well all go, for three with the ray pistols would be safer than splitting the party up. Also there might be heavy work to do, where two ray pistols would be needed.

THEY found their first difficulty in opening the door. It was an automatic door, and was easily opened by compressed air—or dynamite, apparently. They finally were forced to tear it out with a ray. It was impossible to move it in any other way. The door was in what was now the floor, so the walking was bad.

They let themselves through the narrow opening of the door one at a time, and landed on the sloping wall of the corridor beyond.

"Lucky this wasn't a big room, or we would have had a nice drop to the far wall!" said Wade. The suits were equipped with a thin vibrating diaphragm that made speech easy, but Wade's voice came through with a queerly metallic ring, for the diaphragm had a definite period of vibration, and all tones were somewhat distorted.

"No, that wouldn't be so nice, but we can't stay here. We may as well start. There seems to be a defect in the lighting system; it certainly is dark. Wade, use the hand light, will you? You were wise in picking it up. I had an idea that we would have all the light we needed—I don't know just how I got the impression—but I did. Look—there is a corridor sloping off to the right—down, I should say. Be careful when you go in, for if it is long, or opens into a long room, you will be due for a nasty fall," said Arcot, pointing to a dark hole in the wall, as Wade's hand-light reached out in the darkness. The place was too big to light adequately.

"It does seem to be long," said Wade as he turned his light into it, "but it also seems to be rough. I think we can do it. I notice that you brought a rope, Arcot; I think we can use it to advantage. I'll go first, unless someone else wants to go."

"You go first? But I don't know—if we are all going, I guess you had better, at that. It would take two ordinary men to lower a big hulk like you. On the other hand, if anybody is going to stay, you're delegated as elevator boy!"

Wade was a fragile little fellow of about six feet four, and would certainly make a very respectable load for any one, or any two. Arcot, however, measured six feet two, and with the aid of Morey, he should certainly have been able to swing the problem, for Morey was six feet six, though not quite as heavily built as Wade.

"Still," continued Arcot, "I think none of us will need to hold the weight of the others with the rope. I have an idea that may work out very nicely. Wade, will you get three fairly good-sized pieces of metal, something we can tie a rope to? I think we can get down here without the help of anyone else. Morey, will you cut the rope in three pieces while I held Wade tear loose that girder?"

Arcot refused to divulge his secret till his preparations were complete, but worked quickly and efficiently. With the aid of Wade, he soon had three short members, and taking the rope that Morey had prepared, tied a length of rope to each piece of metal, leaving a piece of rope about twenty feet long hanging from each. Now he carefully tested the knots, and the holds the ropes had on the metal to make sure they would not slip.

"Now, let's see what we can do." He took a piece of the rope and put a small loop in one end, thrust his left wrist through this, and grasped the rope firmly with his hand. Then he drew his ray pistol, and adjusted it carefully for direction of action. The trigger gave him control over power. Finally he turned the ray on the block of metal at the other end of the rope. At once the metal pulled vigorously, and taughtened the rope, then, as Arcot increased the power, he was dragged slowly across the floor.

"Ah—it works. Come on, boys, hitch your wagon to a star, and we will go on with the investigation. This is a new, double action parachute. It lets you down easy, and pulls you up easier! I think we can go where we want now, only don't get nervous and turn on the full power of the ray, or you will be minus one good arm, and perhaps your life."

With Arcot's simple brake, they lowered themselves into the corridor one at a time, for they must not let the ray play on each other, as it inevitably would were one above the other. The ray was fatal to any one it touched.

Wade went first with the light, then came Morey, then Arcot.

The scene that lay before them was one of colossal destruction. They had indeed stumbled on the engine room. They could not hope to illuminate its vast extent with their little hand-light, but they could gain some idea of its magnitude, and of its original layout. The floor, now at a steep angle, was torn up in many places, showing great, massive beams, torn and twisted like so many wires, while the heavy floor plates were crumpled like used paper. Everywhere the room seemed covered with a film of metal, shiny and white, it looked like silver, and, after a brief examination, they decided it was silver, scattered broadcast over the walls of the room. It was some time before they could understand its source.

"Oh—look—Arcot—Wade—that's where the silver came from!" Morey was pointing toward the dim ceiling, and as Wade turned the light in that direction they too saw. There was a network of heavy bars running across the roof, great bars of solid silver, fully three feet thick, but in one section there was a hole, as if someone had sent a disintegration ray against them, for not only were they gone, but there was a hole in the metal roof above, a hole that had plainly been fused, as had the great silver bars.

"Lord—bus bars—three feet thick—what nice engines they must have! Look at the way those were blown out! They were short circuited by the crash, just before the generator went out, and they were just volatilized! Some juice behind them!" Arcot looked in wonder at the heavy metal bars. "Keep the light up there, I'm going to try to investigate."

Arcot took a shorter hitch on his rope, and floated up to the roof, examining the heavy bars. He looked at them for a moment, then quickly he lowered himself. They had just been fused by the current of electricity, he was assured. They had barely entered the great room. They lowered themselves to the dim, far side, where they had been able only to distinguish vast lumps of metal. The distance must have been two hundred feet across. Carefully they lowered themselves, and gingerly stood on the piled masses of wrecked machines.

A careful examination was impossible; they were wrecks, but Arcot did see that they seemed mainly to be giant electrical machines of standard types, but on a scale gargantuan. There were titanic masses of wrecked metal, iron and silver, for with these men silver seemed to replace copper, though nothing could replace iron and its magnetic uses.

"They are just electrical machines, I guess," said Arcot at last. "But what a size! They seem wholly electrical, don't they, Wade?"

"I have been looking the mass over, and they do, but there are just two things that bother me. Come here." As Arcot jumped over, nearly suspended by his ray pistol, Wade directed his light on a small machine that had fallen in between the cracks in the giant mass of broken generators. It was a little thing, apparently housed in a glass case. There was only one difficulty with that assumption. There was a large cast iron base of a generator lying on it, made of metal perhaps two feet thick, and that metal was cracked where it rested on the case, and the case, made of material an inch and a half thick, was only slightly dented.

"Whewwww—that's a nice kind of glass to have! I wonder if we can't lay our hands on some and examine it? Oh—I wonder—yes, it must be! There is a window in the side up there toward what was the bow that seemed to me to be the same stuff. It is buried about three feet in solid earth, so I imagine it must be."

The three made their way at once to where they had seen the window. The frame was evidently steel, or some such alloy, and it was twisted and bent under the blow, for this was evidently the outer wall, and the impact of landing had flattened the rounded side like an old can. But that "glass" window was quite undisturbed! There was, as a further proof, a large granite rock lying against it on the outside, which was not remarkable, except that the big rock had been made into little ones by the crash, quite as effectively as could be done by anyone sentenced to hard labor. The window was tough, to say the least.

"Say—that's some building material! Just look at that granite rock—smashed into sand! Yet the window is scarcely scratched! Look how the frame that held it is torn—just torn, not broken. I wonder if we can tear it loose altogether? I'll take my ray pistol and try it from here, but if it comes loose we will have a shower of stones and dirt, so look out!" said Arcot, stepping forward. There was a thud as his metal bar crashed down when the ray was shut off. Then, as the others got out of the way, he stepped toward the window and turned his ray on it. More and more power was used, till suddenly there was a rending crash, and they saw only a leaping column of earth, and sand, and broken granite flying up through the hole in the steel shell. There was a sudden violent crash, then a moment later a second equally violent crash as the window, having flown up to the "ceiling" came thumping back to the floor.

"Wait a moment till the dust settles, and we will see what our prize looks like," called Arcot over the din of falling stones and dirt. He had jumped back as soon as the window came loose, but nevertheless he had collected a nice little lump on his head from a falling stone. The altitude suit had offered considerable protection, but he decided that he might have done better, as he rubbed his head rather ruefully.

AT last the dust had, to a large extent, settled, and they came forward, looking for the window. They found it, somewhat buried by the rubbish, lying off to one side. Arcot bent down to tilt it and sweep off the dirt; he grasped it with one hand, and pulled. The window remained where it was. He grasped it with both hands and pulled harder. The window remained where it was.

"Uh—say, lend a hand will you, Wade—you're big enough; see if you can lift it." Together the two men pulled, but the results were exactly nothing. That window was about three feet by two feet by one inch, making the total volume about one-half a cubic foot, but it certainly was heavy. They could not begin to move it. An equal volume of lead would have weighed about four hundred pounds, but this was decidedly more than four hundred pounds. Indeed, the combined strength of the three men did not do more than rock it.

"Well—it certainly is no kind of matter we know of!" observed Morey. "Osmium, the heaviest known metal, has a density of twenty-two and a half, which would weigh about 730 pounds. I think we could lift that, so this is heavier than anything we know. At least that's proof of a new system. Between Venus and Earth we have found every element that occurs in the sun. These people must have come from another star!"

"I think they do," returned Arcot, "but for other reasons. I think I know where this kind of matter exists in the solar system, which eliminates that reason. I think you have already seen it—in the gaseous state. Do you remember that the Kaxorians had great reservoirs for storing light-energy in a bound state in their giant planes? They had bound light, light held by the

gravitational attraction for itself, after condensing it in their apparatus, but they had what amounted to a gas—gaseous light. Now suppose that someone makes a light condenser even more powerful than the one the Kaxorians used, a condenser that forces the light so close to itself, increases its density, till the photons hold each other permanently, and the substance becomes solid. It will be a very dense solid, and a very hard solid. It will be matter, matter made of light—light-matter—and let us call it a metal. You know that ordinary matter is electricity matter, and electricity matter metals conduct electricity readily. Now why shouldn't our 'light matter' metal conduct light? It would be a wonderful substance for windows.

"But now comes the question of moving it. We can't lift it, and we certainly want to examine it. We didn't do what everyone expected us to, whereas all the others probably will, and since our laboratory hasn't been brought here, we must take what we want to the laboratory. It will probably save time at that. I think we are about through here—the place is clearly quite permanently demolished. We can never find what we want here, so I think we had best return to the ship and start to that other machine we saw that hadn't been so thoroughly destroyed. Now the question is, can we move this?"

"I think a ray may move it. Of course it may not—but I think it will!"

"I should say it would!" said Wade, looking suggestively at the dirt scattered on the floor, and the broken window frame.

"Not necessarily. It might have been the pressure of the dirt on the window, though I don't think so. But here is the way to decide," replied Arcot.

He drew his ray pistol, and stepped back a bit, adjusting the pistol so the ray would direct the plate straight up. Slowly he applied the power, and as he gradually increased it, he reached a point where the plate heaved, then moved into the air.

"It works! Now you can use your pistol, Morey, and direct it toward the corridor. I will send it up, and let it fall outside, then we can pick it up later." Morey stepped forward, and while Arcot held it in the air with his ray, Morey propelled it gently with his, till it was directly under the corridor leading up. Then Arcot gave it a sudden increase in power, and the plate scaled suddenly upward, sailing out of sight. Then, as Arcot shut off his ray, there came to their ears a sudden crash as the plate fell to the floor above.

The three men at once regained their ropes, and "double action parachutes" as Arcot called them, and floated up to the next floor. Here they waited till the last had arrived, then again they started the process of moving the plate. All went well till they came to the little car itself. They could not use the ray on the car, for fear of damaging the machinery. They had to use some purely mechanical method of hoisting it in.

"I think we can do it, Wade, if you will find some beams about ten or twelve feet long—not some girders that weigh half a ton themselves, but some lighter beams that we can put across our shoulders, and let you maneuver the plate upon them. Then we will slide it into the ship. If we have only about one-eighth of the weight, I think we can do it. From the feel of the pistol, I should say it weighed about 2000 pounds. Using the wheelbarrow principle will permit us to hold it."

The two men released their rays, and permitted the plate to settle to the floor; then they began their search for beams.

Beams there were in plenty—great, heavy stringers that could have held the greatest of the modern towers—and there were long stringers that were designed to prevent bending stresses, shaped, and built like bridge members. Whoever designed this ship, they decided, was not trying to conserve either metal or weight. They didn't seem to use anything smaller than a three-foot deep I beam. It would have taken a derrick to move the beams, let alone the plate!

Finally they solved the problem by using the molecular director ray to swing a heavy beam into the air, then one man pulled on the far end of it with a rope, and swung it till it was resting on the door of the ship on one end, and the other rested in a hole they had torn in the lining of the tube.

Now they maneuvered the heavy plate till it was resting on the beam; then they released the plate, and watched it slide down the incline, shooting through the open doorway of the car. In a moment the beam was moved, and the job, which had seemed next to impossible, had been very satisfactorily done, except that the plate had landed in the exact center of the car, and it was rather difficult to navigate inside the machine now. There was a slight curvature to the plate, and stepping on it was apt to cause a fall.

The plate at last safely stowed, the three men climbed into the car, and prepared to leave.

THE little machine glided swiftly down the tube through the mighty ship, finally coming out through the huge rent that had admitted them. They rose quickly into the air, and started at once for the headquarters of the government ships. The public had been kept in ignorance, and since the section where the ships had fallen was quite deserted, there were no civilians with their craning necks, always in the way of the operations that must be carried on now with the maximum of efficiency. Already there were a great number of scientists gathered about the headquarters ship. As Arcot's party arrived there first, they were now permitted to choose their field of exploration, each of the wrecks being assigned to one group. Arcot decided at once that the nearly perfect ship lying off to the west would be their choice. They were at once assigned to this machine, and two Air Patrolmen were sent with them.

"Lieutenant Wright and Lieutenant Greer will go with you. In case of necessity they may be able to help considerably. Is there anything we can do to help?" asked the Colonel.

"I believe these men are all armed with the standard revolver, are they not?" replied Arcot. "I think we will be considerably safer if I arm them with some of the new director ray pistols. I have several in the tool box of the machine. It will be all right, I suppose?"

"Certainly, Dr. Arcot. They are to be under your commands."

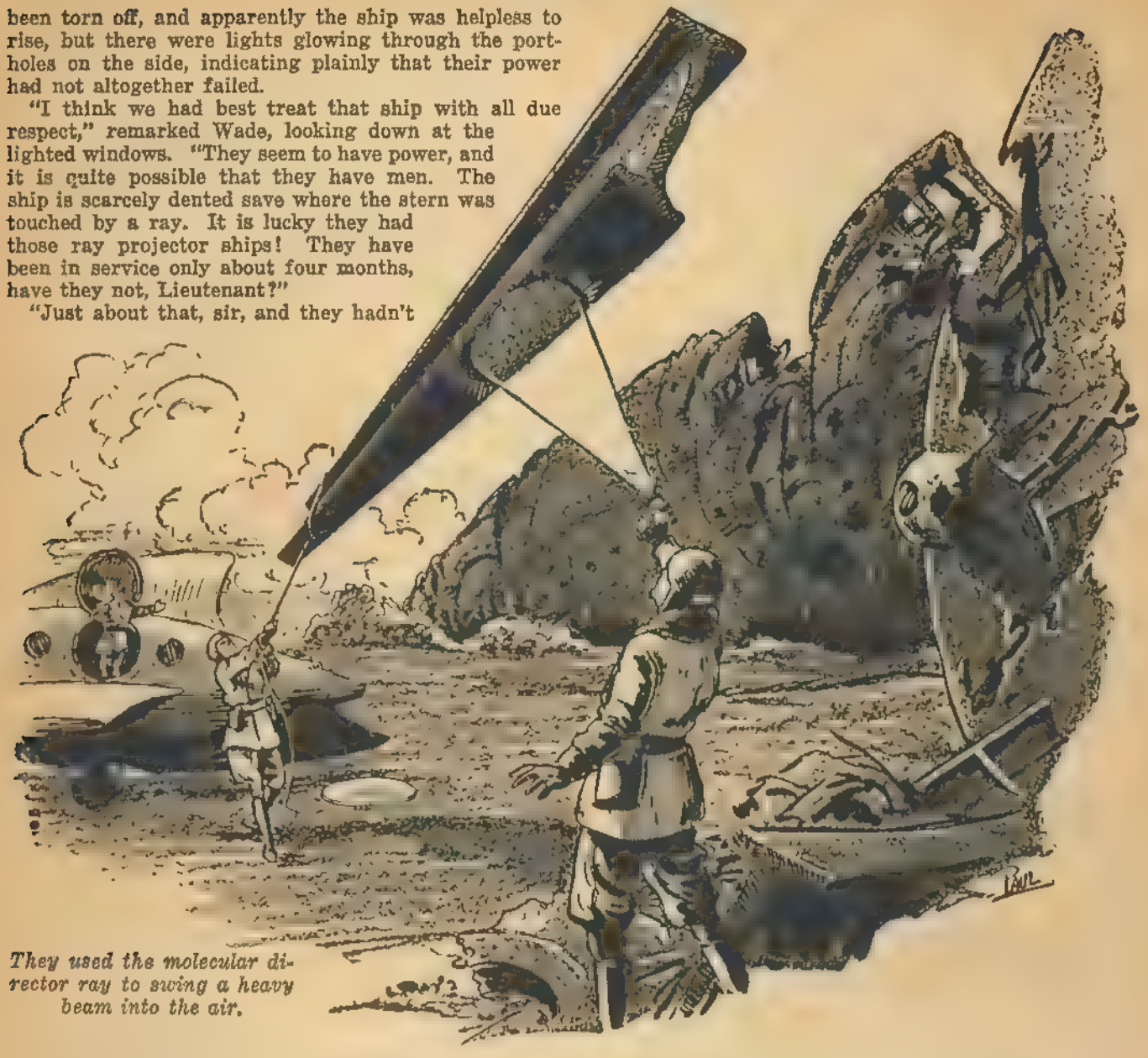
The party, increased to five now, returned to the ship, where Arcot showed the men the details of the ray pistols, and how to use them. The control for direction of operation of the ray was rather intricate on these early models, and required considerable explanation. The range of even these small weapons was infinite in space, according to theory, but in air the energy was rather rapidly absorbed by ionization of the air, and the dispersion of the beam made it ineffective in space over a range of more than thirty-five miles. However, the larger ship projectors had a longer range, and these were certainly sufficient for their purpose as hand weapons.

Again entering the little molecular motion car, they went at once to the great hull of the fallen ship. They inspected it cautiously from a height before going too close, for the ship had very obviously landed without the terrific concussion that the rest had experienced, and it was very probable that many men in the machine were still alive. The entire stern of the huge machine had

been torn off, and apparently the ship was helpless to rise, but there were lights glowing through the portholes on the side, indicating plainly that their power had not altogether failed.

"I think we had best treat that ship with all due respect," remarked Wade, looking down at the lighted windows. "They seem to have power, and it is quite possible that they have men. The ship is scarcely dented save where the stern was touched by a ray. It is lucky they had those ray projector ships! They have been in service only about four months, have they not, Lieutenant?"

"Just about that, sir, and they hadn't



They used the molecular director ray to swing a heavy beam into the air.

gotten the ray pistols out in quantities great enough to be distributed as yet. It was fortunate that those ships were in service," replied the Air Patrolman.

"I wonder why they didn't greet us with some of their rays," said Morey, with a rather worried look. It did seem that there should be some of the rays in action by now. They were less than a mile from the ship, and moving rather slowly.

"I have been puzzling over that myself," replied Arcot, "and I came to the conclusion that either the ray projectors are fed by a separate system of power distribution, which has been destroyed, or that the men are all dead."

They were to learn later, in their exploration of the ship, that the ray projectors mounted on the ship were fed from a separate generator, which generated a special form of alternating current wave for them. This generator had been damaged by the ray of the terrestrial ship that had brought them down.

The little machine was well toward the stern of the giant now, and they lowered it till it was on a level with the torn metal. It was plain that the ship had been subject to some terrific tension, for it had contracted at the tail here, as a rubber band contracts its cross section when stretched. The great girders were stretched and broken like wires, and the huge ribs were bent and twisted like so many pieces of lead. The tube, which ran the length of the ship, since it had been smaller than the ship, and nearly as strong as the outer walls, had suffered more. It had been drawn down to about three-quarters its original diameter, and the ship could not enter. They were able to remedy this, however, by using their ray. It was soon opened out, and the machine glided slowly into the dark tunnel. The searchlight reaching ahead filled the metal tunnel with a myriad deceptive reflections on the polished metal walls. The tube was lighted up for the full length ahead of them, and seemed empty. Cautiously, they advanced.

"Wade—Morey—where shall we stop first—I think we had better investigate the engines first. They will probably be of prime importance. We know where they are. What do you say?" asked Arcot, who was at the controls.

"I agree!" replied Wade, and Morey joined him in his approval at once.

They ran the ship down the long tube till they again reached the door they knew must be at the engine room landing, and stepped out of the car, each wearing an altitude suit. This ship had landed level, and progress would be much easier than in the other one. They waited a moment before opening the door from the tunnel into the engine room, for this opened into a narrow

corridor where but one could pass, and the corridor opened directly into the engine room, as they learned from investigation on the other ship. The three scientists explained this quickly to the air men, and they insisted on leading the way. They had been sent along for the express purpose of protecting the scientists, and it was their duty to lead.

"I was given orders to take my orders from you," Lieutenant Wright said, "but those orders also said I was to see to it that you were protected. In this case the orders are conflicting, and I will have to use my judgment. You are needed by this world, and Venus too, more than any other three men in the system, and I certainly think we should go ahead. Besides, with the ray pistols, why worry?"

He at last won his point, and the two officers stepped to the door, and standing off to one side, tore it open with a ray from their pistols. It fell with a clatter to the rounded metal floor of the tube, and lay their vibrating noisily, but no rays of death came from beyond. Cautiously the two officers peered around the corner of the long corridor, then, seeing nothing, leaped to the floor of the corridor, which was a bit higher than the floor of the tube, and started along it. Wade came next, then Arcot, followed by Morey, who, much to his disgust, had drawn the shortest of three match sticks.

The corridor was perhaps thirty feet long, then it opened into the great engine room. Already the men could hear the smooth hum of powerful machines, and see the rounded backs of metal giants.

From the engine room ahead came only the steady low purr of the giant machines, but there was no hint of human life. The men advanced steadily.

At last they reached the threshold of the engine room.

"Well—we haven't seen anyone, and no one has seen us," said Arcot in a low voice, "but they may be behind one of those giant engines, quite unaware of us. When they see us they will be ready to fight. Now remember, those weapons you have will tear loose anything they hit. You have some appreciation of the power of those engines, so don't put them out of commission, and have them release their energies in the neighborhood. We wouldn't last long, and it may be, if they are driven as I suspect, that the Earth itself would be disturbed by their explosion. It is only luck that some of them did not explode when the ships were brought down."

"But look out for those men, and get them if they try for you!"

CAUTIOUSLY, but quickly, they stepped out into the great room where they might be able to use all of their rays at once, instead of one at a time. Each had his ray pistol in his hand, ready for instant action. They walked out into the room, glancing swiftly about them—and simultaneously the enemies caught sight of each other. There were six of them, tall men, about seven feet high, and they walked with the rather labored step of a Venerean, but they weren't Venereans, for their skin and flesh was a strange white, which looked like raw dough. The eyes of men seem to work with photographic exactitude and speed in an emergency. It seemed to Arcot that those strange pale men were advancing at a slow walk, and that he stood still watching them as they slowly raised their strange ray pistols. He seemed to notice every detail—their short, tight-fitting suit of some elastic material that didn't hamper their movements, and their strange flesh, which just seemed to escape being transparent, because it was too dense. Their eyes were strangely large, and the black spot of the pupil in their white corneas seemed intensified by contrast. Then they were leaping at him, and he responded with a sudden flick of his ray, as he flung himself to one side. Simultaneously his four companions let their rays fly toward the Invaders. They glowed strangely red here, more nearly resembling the reddish hue of the enemies' rays. It was obvious that this atmosphere contained some other gas than our air. But those rays were still effective, and the six Invaders were suddenly gone, but not before they released their own rays. On the floor of the mighty ship there lay one man who would never rise again. Their ray had touched Lieutenant Wright.

The Terrestrians scarcely had a chance to notice this, for immediately there was a terrific rending crash, and clean daylight was pouring in through a huge opening in the wall of the ship. The men of the Invaders had been standing before the metal wall, and when the five rays flew at them, they had been repulsed violently, going back toward the walls, and with them the section of the wall had flown out.

Suddenly there was a second jarring thud, more as of a dull explosion; then there was a great sheet of flame in that hole—a great wall of ruddy flame that filled the gap, and swept rapidly in. Arcot swung up his ray pistol, and pointed it at the mass of flaming gas. There was a rushing column of air coming through the narrow corridor from the tube, but the flame went out, and became a roaring column of gas on the outside of the ship.

"Lieutenant, turn your ray on that hole, and keep it there, blow that flame outside with it. You will find you can't put it out, but if you keep it outside the ship, it will be all right!" The officer swung his ray at it and relieved Arcot.

Wade and Morey were already bending over the fallen man. They could do nothing more for him.

"I'm afraid there is nothing we can do for him, and every moment here is dangerous. We will continue our investigation and carry him back to the ship when we leave. Does that suit you?" asked Arcot.

"I suppose there is nothing else to do—but why is that gas burning so—can't we put it out?" asked Morey.

"Let's get through—the discussion comes after," replied Arcot with a smile, and turning, they set out on their investigation somewhat silenced by that figure lying on the metal floor there.

The bodies of the Invaders were gone, and they could make no examination of them now. They must hope that some of the other investigators would find them. That was a matter for the doctors and biologists, anyway. They were investigating the engines, which seemed to overtower everything about them.

Perhaps it was this that permitted the three other engineers of the Invaders to get so close. The only warning the Terrestrians had, was a sudden feeling of faintness as they stepped around the corner of an engine, and a slight pink haze. They leaped quickly back, out of sight, peering around the corner in wonder. There was nothing. Soon they saw a hand reaching out with a ray gun; then another hand with a different ray gun, from behind the silent engine; a sudden crash of metal, a groan and quiet. Two other men leaped from behind the great engine, just as the Terrestrians dodged further back. In an instant these others were behind another mass of metal. Arcot swung his ray up, and was about to pull the trigger that would send the huge engine toppling over, when he saw that it was running. He was afraid of the consequences and desisted. Cautiously he looked around the edge of the huge mass of metal, and watched—patiently—ah—his ray snapped out, and there was another snapping as the ray tore off the head of one of the Invaders, pulling him into its range to be instantly annihilated, then spending itself on a huge mass of metal—a mighty transformer of some sort. The thing was so huge, that in the low concentration that Arcot had used, it merely tottered a bit.

Only a small portion had been touched, and the molecules of this portion had not been enough to tip its mighty weight over.

There remained one man, and Arcot saw that he was certainly in action, for almost before he could dodge back there came a ray of pink haziness. To Arcot's amazement it touched his hand, outstretched as it had been when he fired, and a sudden numbness came over it. The ray pistol seemed to lose all feeling of warmth or cold. It was there; he could feel the weight of it on the muscles of his upper arm, but his forearm was deadened. In an instant his hand was out of the ray. It seemed less than a second before feeling began to return, and in less than five his hand was perfectly normal again.

"Whew—that was a most unpleasantly narrow squeak! It hit my hand, but I must say their ray is a gentlemanly sort of thing. It seems to kill you altogether, or not at all. But we had best keep our eyes open—there goes his ray!"

A shaft of pink radiance reached about the end of the engine, just grazing it. It would certainly be impossible to step out into the open space—but they couldn't stay here forever. There would be reinforcements soon! Evidently the mass of metal was opaque to the death ray.

"Look—he is under that big metal bar—up there in the roof—see it? I am going to pull it down; he may get nervous and come into sight. I will be careful not to hit anything else!" said Wade, raising his ray pistol. Arcot leaped quickly forward, and held his trigger release.

"Lord—don't do that, Wade—there may be more stuff above, or those bars may connect the different engines, and if they are necessary, and you remove them, I don't care to be here. The only way is to fight it out. This war that we have coming is going to be a war of science and rays, the most powerful weapons of science. We have a little individual duel here, and it is a duel of rays, so let's fight safe and fair. I am going to try to get around on the other side of the machine here, and see what I can do, while you fellows keep him occupied."

ARCOT disappeared around the corner of the black, humming giant, and they waited anxiously for some sign of him. They waited what seemed long years, then suddenly the ray that had been playing at irregular intervals across the end of the machine, swung quickly to the other side, and simultaneously a duller red ray seemed to leap from the machine itself toward the source of the ray. The two rays met, and crossed, and by some trick of fate, they seemed mutually antagonistic, and there was a crashing arc for an instant, then both went dead, as the apparatus that generated them were blown out by the terrific momentary overload. But the Invader was, apparently carrying a spare, for the Terrestrians saw him leap toward his enemy with another projector, trying quickly to draw it from his pocket pouch. They turned their rays on him, a very low concentration Wade used, hoping only to knock him over by the repulsion effect of the directed molecules. But Morey was not so sure of the morals of the Invader, and used a higher power. Just as his projector at last came free, the ray hurled him to the left, and away from his men. He crashed into a huge motor, and the result was not nice.

The projector had been jerked from his hand and lay off to one side on the floor. Arcot ran over to it, and picking it up, called out to his friends: "You saved me that time—I think I would have gotten him at that, if his ray hadn't affected mine in that way. I can't understand it; it doesn't seem possible—but still, our ray is really a projected electro-static oscillation, and it is quite possible that his was of the same nature, in a different frequency. They would have neutralization points, and the effects on the projectors would throw both machines out of tune, and the rays would soon reach a common mean I suppose—I am going to take this, and see if I can figure it out. I doubt it, though; the essential apparatus was in that pack on his back, just as ours was." Arcot stopped, listening to the Lieutenant's call.

"We are all right now, I think—I hope there are no more—but by all means stay where you are, and use as little power as possible on blowing that flame outside. It uses up the atmosphere of this ship, and I think we better take it easy here! We're going to investigate; don't hesitate to call us if anything looks queer."

The three men at last felt that they had an opportunity to inspect the machinery. For nearly a minute they looked about them in awestruck wonder. These men had been the first men of Earth to see the driving equipment of one of the titanic Kaxorian planes, and then they felt tiny beside its mighty bulk; but now, as they examined this huge engine room, they realized that even the huge plane shrank into insignificance beside this huge interstellar cruiser.

All about them there loomed the great rounded back of huge electric motor-generator sets of some sort. Across all the roof there ran a network of gigantic metal bars, apparently conductors, but so huge they seemed, that they suggested heavy structural members. There were several as much as three feet in diameter, and apparently solid metal. The huge machines they ran into loomed fully thirty feet into the air; like a modern electric generator; they were longer than high, huge cylinders, thirty feet in diameter, and there was a group of four main machines that were each easily a hundred and twenty feet long! There were four of these giants, and many smaller machines, yet these smaller ones would easily have constituted a complete power supply for the average big city. Along each wall ran a bank of huge transformers. These seemed connected with the smaller machines generally, there being four conductors leading into each of the minor units, two intake, and apparently, two output leads, suggesting rotary converters. The multiple units, and various types and sizes of transformers made it obvious that many different frequencies were needed. Some of the transformers had air cores, and led to machines surrounded with a silvery white metal, instead of the usual iron. These, apparently, were generating current at an extremely high frequency.

"Well—they ought to have power enough. But do you notice that those four main units have their leads radiating in different directions? The one on the left there seems to lead to that big power board at the front—or better, bow. I think it would be worth investigating," suggested Morey, pointing out the rounded back of the huge machine he meant.

"I think there is considerable of interest in it myself. You notice that two of the main power units are still working, but that those other two have stopped? I think they have something directly connected with the motion of the ship under their control. But there is one point I think is of still greater interest. All the machines we have seen, all the conspicuous ones, are secondary power sources. There are no primary sources visible. I notice, however, that those two main conduits on the roof lead over to the right, and toward the bow. I think that it would be interesting to investigate that," said Arcot. Indeed, all the huge motors, and the generators driven by motors, were not self-sufficient sources of power. There must be some input point, and as yet they had not found it.

"I think that would be a good idea. I was just wondering what those big conduits were made of. They certainly make nice little bus bars. They are fairly soft, and fairly ductile, as far as I can see. I tore a piece off of one of them, and it seems to me to be pure silver. You are the chemist, Wade. What do you say?" asked Morey, passing his sample to his companion.

"I think it is—it looks like silver, but that is no proof. I want to test it, though, and the stuff would make a rather expensive, if efficient conduit. The copper we use is not as good a conductor, but it is a little lighter, and it is a lot cheaper."

"I don't think they would have much trouble getting their silver. I think it is quite possible that the planet they come from should have a lot of native silver," replied Morey.

As they talked they had followed the huge conductors back to their point of convergence. Suddenly they rounded the corner of one of the huge main power units, and saw before them, at the center of the square formed by these machines, a low platform of the clear light-metal. At the exact center of this raised platform, which was twenty feet in diameter, there was a small table, about seven feet on an edge, and raised about five feet from the level of the platform on stout light-metal legs. On the table there were two huge cubes of solid silver, and into these great cubes ran all those conductors they had seen. In the space perhaps six inches left between the great blocks of metal, there was a small box constructed of a new material. It was the most absolutely reflecting substance that any of the men had ever imagined. Indeed, it was so perfect a reflector that they were unable to see it, but could detect its presence only by the mirror images, and the fact that it blotted out the objects behind. Now they noticed that through the huge blocks of metal there were two small holes, and two thin wires of this same reflecting material led into those holes, but carefully insulated from the metal itself by a coating of the light-matter. The wires were led directly up to the roof, and then hung on three-foot hangers of the light-metal; they were led toward the bow.

Could this be the source of the power for the whole ship, wondered the puzzled scientists? It seemed impossible, yet there were many other impossible things happening here, and that strangely reflecting matter was one of the strangest.

There was a low railing about the cubes, and their little center piece, apparently intended to keep men from coming in contact with it, so they decided that it was wisest to leave it alone.

They had scarcely looked at it carefully, had not even found time to ask each other questions, when the lieutenant called to them that he could hear sounds behind him.

At once the other men ran rapidly toward the narrow corridor that had given them entrance. The flaming gas was still shooting through the hole in the wall of the ship, and the rush of air through the corridor made it very difficult to hear any sounds there, and the same rush of air made it exceedingly difficult to walk.

"Turn on more power if you can, Lieutenant, and see if we can't draw out the enemy," suggested Arcot, while his friends got in position around the tube exit, well braced.

As the officer increased the power of his ray, the moan of the air through the tube-like corridor increased suddenly to a terrific roar, while an additional roar came into the ears of the men, as the powerful blast of air struck a peculiarly shaped projection and set it vibrating. But no enemies came out.

"I don't think anything less than a war tank could stand that blast," said Arcot, after the Lieutenant had shut off the blast from his pistol, at Arcot's signal. "It is probable that we will be attacked if we stay much longer, though. I think that I will ask the Lieutenant to stay here while we go out and get the ship ready to leave. This time you are somewhat in the condition of Hercules after Atlas left him holding the skies on his shoulders. You can't let go of that ray pistol for long, or we will have a first rate explosion," grinned Arcot. "We are going to go back first, if you men wouldn't let us come in first. We refuse to relieve you, and this time, though your orders conflict, you can use your judgment only one way! We will signal you by firing a revolver, and then you can come back to the corridor, snap off your ray, and run into the ship which will be waiting.

"We have one duty to perform first; we will carry this man back to the ship. He was a brave man, and he certainly deserves burial in the soil of his own world."

"I think I will look up his family, too, Morey, and your father's company will have to increase my salary a little."

SLOWLY the men forced their way back toward the ship, fighting their way against the roaring column of air, their burden hindering them somewhat; but at last they reached the open tunnel. Even here the air was in violent motion.

"We had better get out of here," said Arcot, feeling the draft of air coming up the tube from the open end. "I am sure we are due for an explosion."

They got into the car as quickly as possible, and arranged to reverse it. Then Wade fired the signal shot. A moment later they saw the Lieutenant fighting his way back against the pressure of the air, which had continued for a while under its own momentum of motion.

But, by the time he was in the car, there was an ominous calm. The car was already backing swiftly down the corridor, and had gotten nearly free, when suddenly there was a dull sound ahead of them, and the car was caught on a wave of pressure, and they were hurled backwards with a terrific acceleration. They had been headed straight out. The pressure seemed uniform, and luck was with them, so they reached the open air, shooting backwards at a speed of several hundred miles an hour, the great tunnel, with its strong walls, and flared opening, acting like some gigantic blunderbus, with the car as its bullet. Arcot did not try to slow down the little ship, but drove his foot down heavily on the vertical accelerator, and the ship rocketed up with terrific speed, and the acceleration seemed to pin the men down to their seats with tripled weight. They had climbed nearly a mile before the explosion came. A terrific concussion it was, a dull thud of exploding gas, and the little ship rocked and heaved in the vortex of rushing gas, for they were scarce a full length away from the great wreck, a mile long it was, and would easily have reached up to them. The entire ship though, now, as they looked at it, seemed to soundlessly disintegrate, and they realized the reason. They were rushing away from it faster than the sound it made, and they could not hear the explosion. The great ship seemed to leap into a hundred great parts. It split throughout its length, falling in huge broken masses of metal all about it. One huge fragment was thrown high into the air to fall on the ground beside it, and drive itself deep into the soil.

But the explosion was over in an instant, and there came a momentary lull. Suddenly, from the wrecked engine room, there shot out a beam of intense white light that reached down and struck the soil beside the

ship, and a part of the ship itself. In an instant the soil, and that bit of the ship were glowing incandescent, and slumped molten, volatilizing, beside it. The beam suddenly began to shift, faster and faster, as the support that was holding it was melting, it twisted about, reaching forward, cutting the mighty ship in two like a hot knife melting its way through a piece of butter. It had but half completed this maneuver, when there came a sudden blast of light from the point where the beam originated, and the entire region became a lake of molten metal, while the Terrestrians flew blindly, their eyes temporarily dazzled by the light. I call it a blast of light, for so intense was it that no other word adequately describes it—a light that melted all metal about it instantaneously.

"I think it is time we left that machine!" said Wade, looking down in amazement and horror at the pool of glowing metal that marked the last of the great ship.

"That last flash must have been the power plant going. Don't you suppose so, fellows?" asked Arcot. "It certainly had plenty of power!"

They looked at the mass of blazing metal in awe, as Arcot brought their flying ship to a halt, and slowly lowered it. As they descended, the roar of the explosion reached them. Though a full mile and a half away, the heat that beat up at them from the great mass of metal was so intense as to make the ship most uncomfortably warm.

"I am wondering whether any of the other ships will do the same. We ought to warn all the others before they do," suggested Morey.

"I believe they will come—remember what a noise that explosion made when the sound did catch us, and then, since we were going away from it very rapidly, the Doppler effect lowered the frequency of the sound so much that what we felt as mechanical vibrations, were actually sound waves. What we heard as a low, powerful rumbling, were actually high notes of the explosion, so you can appreciate the actual power of that sound. It will serve as a very effective warning to the other men," replied Arcot. Indeed, by the time they had returned to the central headquarters machine, and brought to the staff the unpleasant news of their encounter in the ship, many other machines were coming in from the other ships. Half an hour later the three men were again flying swiftly, now toward New York, where Arcot's laboratory was located.

"Well, fellows, what are your opinions on it? Wade, you are our chemist, tell us what you think of the explosion of the ship, and of the strange color of our molecular ray in their air," suggested Arcot.

"I have been trying to figure it out. I can't quite believe my results, yet I can't see any other solution. That reddish glow looked like hydrogen ions in the air. The atmosphere was certainly combustible when it met ours, which makes it impossible to believe that their air contained any noticeable amount of oxygen, for anything above 20 per cent. oxygen and the rest hydrogen would be violently explosive, and apparently the gas had to mix liberally with our air to reach that proportion. That it didn't explode when ionized, showed the absence of hydro-oxygen mixture. All the observed facts except one seem to point to an atmosphere composed largely of hydrogen. There were people living in it. That is the only thing that puzzles me. I can understand how the Venerians might stand a different climate, but I can't see how people can live in an atmosphere like that." Wade was greatly puzzled.

"I came to the same conclusions myself," replied Arcot, himself rather in doubt, "but I think that people might live in an atmosphere of hydrogen. It is all a question of organic chemistry. Remember that our bodies are just chemical furnaces. We take in fuel, and oxidize it, using the heat as our source of power. Those men live in an atmosphere of hydrogen. They eat oxidizing fuels, and breathe a reducing atmosphere; they have the two fuel components together again, but in a way different from our method. It is just as effective.

"I am sure that is the secret of the whole thing."

"Say, Arcot—I believe you're right!" said Wade with an expression of surprised belief on his face. He could see the possibility of the thing. "But I want to ask you a question. Where under the sun did these people come from?"

"I have been thinking that over myself," replied Arcot slowly, "and I am beginning to wonder myself, and the more I wonder, the less I believe they did come from under our sun. Let us eliminate all the planets—we can do that at one fell swoop. It is perfectly obvious that those ships are by no means the first crude attempts of that race to fly through space. If they have had those ships, we should certainly have heard from them by now. It is known that they can travel in space as rapidly as we can in the upper atmosphere, and they would certainly have been here long before, if they had been living anywhere near here.

"Even Neptune is too near for the distance to bother them any with ships like those. They came from further than that! That takes us out into interstellar space. You will probably want to ram a lot of my own arguments down my throat—there is no star near enough for the journey to be made in anything less than a couple of generations, and they would freeze in the interstellar cold doing it. Perfectly correct, there is no known star near enough to make it possible. But how about unknowns?"

"What did they do with the star? Hide it behind a sun-shade?" asked Morey, rather sarcastically.

"No, brainless, you ought to know better. You well know a star can't radiate forever. Stars are subject to decay as well as anything else!"

"Yes—also the planets that circle them are apt to become a wee bit cool, you know!"

"Yes," admitted Arcot, "I agree with you—for all we could do, but give those men credit for a little higher order of intelligence. We saw machines there that certainly were beyond us! They are undoubtedly heating their planets with the same source of energy with which they are running their ships. I believe I have confirmation of that fact in two things. They are absolutely colorless; they don't even have an opaque white skin. Any living creature exposed to the rays of a sun, which is sure to emit some chemical rays, is subject to coloration as a protection against those rays. The whites, who have always lived where the sun is weakest, have developed a skin only slightly opaque. The Chinese, who live in more tropical countries, where less clothes and more sun is the motto, have slightly darker skins, while in the extreme tropics Nature has found it necessary to use a regular blanket of color to stop the rays. Now exterpolating the other way, were there no such rays, the people would become a pigmentless race. Since most proteins are rather translucent, at least when wet, they would appear much as those men did. We got little opportunity to observe them, but I think you all noticed that. Remember that there are very few colored proteins. Hemo-globin, such as is in our blood, and hemo-cyanin, such as in the blue blood of the Venerians, are practically unique in that respect. For hydrogen absorption, I imagine the blood of these creatures contains a fair proportion of some highly unsaturated compound, which readily takes on the element, and gives it up later. But we can discuss more in the lab."

BEFORE leaving the field, Arcot had convinced the officer in charge that it would be wise to destroy these ships at once, lest one of them managed to escape, and do tremendous damage. The fact that none of them had any rays in operation was easily explained; they would have been destroyed by the patrol, if they had made any show of weapons. But now they might be getting some ready. The scientists were all through with their investigations. So the ships had been rayed apart, and when Arcot had left, their burning atmosphere had been evolving mighty tongues of flame shooting a mile into the air. The light gas of the atmosphere tended to rise in a great sphere, a ball that quickly burned itself out in the air. It had not taken long for the last of the machines to disintegrate under the rays. There would be no more trouble from them at any rate! Now Morey asked Arcot if he thought that they had learned from the ships all they could; would it not have been wiser to save them, and investigate later, taking a chance on stopping any ships, keeping a patrol of air guards there.

"I thought quite a bit before I suggested that, and I conferred for a few moments with Dr. Forsyth, the famous biologist and bacteriologist. He said that they had by no means learned as much as they wished, but they had been forced to leave in any event. Remember that pure hydrogen, the atmosphere we were actually living in, while on the ship, is quite as inert as pure oxygen, but they get very rough when mixed together. The longer those ships stood the more dangerously explosive they got. If we hadn't destroyed them, they would have wrecked themselves, and it was so exceedingly unsafe even after the short two hours, that we could not stay there. I think it was wisest. Also, Dr. Forsyth pointed out the danger of disease. We might be susceptible to their germs. I don't believe we would be, for our chemical constitution is so vastly different. For instance, the Venerians and Terrestrians can visit each other with perfect freedom. The Venerians have diseases, and so do we, but there are things in the blood of Venerians that are absolutely deadly to any Terrestrian organism. Venerians have been injected with every known Terrestrian disease, and not even been bothered by the germs. They have no immunity, but their chemical constitution is so different that they don't need it. Sulphuric acid has developed no immunity to the bacteria of decay, but it is so corrosive, it doesn't need any. The Venerians, with their copper compound blood, are fatal to any Terrestrian organism, while Terrestrians are deadly to any Venerian organism. Similarly, Dr. Forsyth thinks, we would be immune to all diseases brought by the Invaders. However, it is safest to remove them first, and decide later."

The three men went rapidly back to New York, flying high above the surface of the Earth, nearly sixty miles above the ground, where there would be no interfering traffic, till at last they were over New York, and dropping swiftly in a vertical traffic lane.

They reached the road of the Arcot Laboratories without any difficulty, and settled the machine lightly in the landing cradle. Arcot's father, and Morey's, were there, anxiously awaiting their return. The elder Arcot had for many years held the reputation of being the nation's greatest physicist, but recently he had lost it—to his son. Mr. Morey senior was the president and chief stockholder in the Transcontinental Air Lines. The Arcots, father and son, had turned all their inventions over to their close friends, the Moreys. For many years the success of the great air lines had been dependent really on the inventions of the Arcots; these new discoveries allowed them to be always one step ahead of competition, and as they also made the huge transport machines for other companies, they drew tremendous profit from these mechanisms. The mutual interest, which began as a pure business relation, had long become a close personal friendship.

Now, as the shining ship drew near, and settled swiftly to the landing cradle, the old friends ran forward together. They had learned of the attack through their sons, and had rushed to the laboratory, for the news was not to be made public immediately.

As Arcot stepped out of his car, he called over to his father, telling them about his find, the light-matter plate.

"I think I'll need a handling machine to move it. I want to get one, but I'll be right back." He ran to the elevator shaft and dropped quickly to the heavy machinery lab. on the bottom floor, where he got a small handling machine, a tractor-like machine with a small derrick, designed to get its power from the electric mains. With a length of cable coiled on the back of the little machine, Arcot ran it on to the elevator, cast loose the power cable, and ran the car swiftly up to the roof again. Here he connected to the power line by means of the long cable, for there were connections here, designed for the handling machines. Then he ran the little machine over to the car, where Wade and Morey were struggling to get the plate into a more advantageous position. They looked up as they heard the rumble and hum of the powerful little machine. From the crane dangled a strong electro-magnet.

"What's that for? You don't expect this to be magnetic do you?" asked Wade, pointing to the magnet.

"Wait and see!" laughed Arcot, maneuvering the machine into position. Soon the crane reached into the car, and lowered the magnet on the plate of crystal. Then slowly he turned the power into the magnet. In a moment the plate had set itself firmly on the magnet. Then slowly Arcot turned the power into the lifting motor. The hum rose swiftly till the full load began to come on the cables. Then suddenly the motor was whining with full power, the cables vibrating under the tension. The machine pulled steadily, then, to Arcot's surprise, the rear end of the machine rose slowly from the ground, tipping forward as the load came on the front end.

"Well—it *was* magnetic, but how did you know?" asked the surprised Wade. Since the ship had been made of the gleaming, only slightly magnetic Venerian metal, coronium, the plate was obviously the thing that was holding the magnet back.

"Never mind—I'll tell you later—jump on here and see if our combined weight won't hold the end down. I think we ought to be able to manage it," replied Arcot, smiling at the puzzled expression on his friend's face.

As the three big men sat on the end of the little machine, the leverage was great enough to pull the plate from the floor; then they quickly backed the machine out, and ran it over to the elevator, where they lowered the heavy plate. Disconnecting the cable, the five men entered the car, and rode down to Arcot's private laboratory. Here the handling machine was again brought into play, and the plate was unloaded from the car.

"I'm with Wade in wondering how you knew the plate was magnetic, son. I can accept your explanation that the stuff is a species of matter made of light, but I know you too well to think it was just a lucky guess. How did you know?" asked the elder Arcot.

"I really had to rather guess at this, Dad, though there was some reason in my guess. You ought to be able to think of it! How about you, Morey?" asked Arcot smiling at his friend.

"I have kept discreetly quiet, feeling that in silence I could not betray my ignorance, but if you ask me, I can

only guess. I do recall that light is affected by a powerful magnet, and I can imagine that that was the basis of your guess," replied Morey. "It had been known for many years, as far back as Clerk Maxwell, that polarized light was rotated by a powerful magnet."

"It was—and now we may as well go over the whole story, and tell Dad and your father the whole case, and perhaps in telling it we can straighten out our own ideas a bit."

FOR the next hour the three men talked by turns, each telling his story, and trying to give some explanation of it, but in the end they all agreed on one thing: if they were to fight the enemy, they *must* have ships that could travel swiftly in space.

"But I wonder if Arcot will now kindly explain his famous invisible light, or the lost star?" said Morey rather sarcastically. He was a bit nettled by his own slowness in remembering the fact that a star could go black.

"I cannot see what connection this has with their sudden attack. If they were there, they must have developed when that star was bright, and as a star requires several million years to cool down, I can't see how they could suddenly appear in space."

Arcot paused before answering. He reached into the drawer of his desk beside him, and pulled out an old briar-root pipe, and carefully filled it, with a thoughtful frown on his face. Contentedly he lit it, then leaning back, he puffed out a thin column of grey smoke that rose straight into the air.

"Those men must have developed on their planets before the sun cooled." He puffed slowly. "They are, then, a race millions, even billions, of years old. I had a hunch that that was so. I can not give any scientific reason for this feeling; it was merely an impression I had. It may have been induced by my beliefs, but I had a feeling that those men were old, older than our very planet! This little globe is not much over one billion years old. I felt that that race was so very ancient they might well have counted the revolutions of this galactic system as, once every twenty or thirty million years, it swung about its center.

"When I looked at those great machines, and those little men as they handled their ray projectors, they seemed out of place. That is the only way I can express that feeling." He paused again, and the slow smoke drifted up.

"They seemed to me to be a group of ancient Greeks in a great modern interplanetary liner. Out of place. They were intelligent, learned in their way, but they did not seem scientists, and it did not seem that they should be handling death ray projectors. It seemed to me that they were a peaceful race. I was surprised when I heard that they had resisted the attempt to arbitrate, until I heard the details of it. I think this war might have been avoided at that, but for one little slip! The operator of the Terrestrial peace-ship attempted to signal the Invaders to land, and he used a searchlight. They were nervous; they were investigating a strange system and they saw a beam of some vibration, they could not tell what, coming at them. In self-defense they struck back. They did not know it was light, and they did not dare to wait and find out. It might not have been; I can understand their fears.

"It must have been millions of years ago that life developed on those planets, the planets of a warm sun, for then it was younger. It was probably rather dim even then. Remember that our own sun is well above the average in brilliance and heat radiation.

"In those long-gone ages I can imagine a race much like ours developing, different chemically, in their atmosphere of hydrogen, but the chemical body is not what makes a race, it is the thought process. They must have developed, and then, as their science grew, their sun waned. Dimmer and dimmer it must have grown, till at last their planets would not maintain their life naturally. Then they had to heat them artificially. There is no doubt as to their source of power; they had to use the energy of matter; there is no other source great enough to do their work. The atomic energy of radium would not begin to do the task. It is conceivable that their science had developed this long before their necessity came.

"With this, must also have come the process of transmutation, and the process they use in driving their Interstellar cruisers. I am sure those machines are driven by material energy.

"But at last their star was black, a closed star, and their cold, black planets must circle a hot, black sun forever! They knew that they were trapped for eternity if they did not escape to some other stellar system. They could not travel as fast as light, and they could escape only if they found some other near-by solar system. Their star was dead—black. Let us call that star Nigra—The Black One. They were invisible as their system swept near ours in space. But all these changes, leading to this last opportunity, must have taken many, many millenniums. We can imagine the race living in their artificially heated worlds, with artificial foods probably, and the millions of stars above them—nothing to do, and no reason to work. They would deteriorate rapidly. I am sure that this was the fate of the race, for these men did not seem to me like men who would develop the giant ships they rode in. It is only a feeling, I would not give that as an official opinion, I merely tell you of my impressions. I am certain, however, that the race would deteriorate under the conditions I named.

"But now they have met with a rare coincidence. They have actually come near another sun. They naturally have every intention of taking advantage of it, and since our sun has been plainly visible to them for many, many years, they were no doubt able to prepare. I believe that this expedition was just intended as exploration, and if they can send such huge machines and so many of them, for mere exploration, I am sure they must have quite a fleet to fight with.

"Let us consider the weapons they will have.

"We know they have that death ray, but that was not quite as deadly as we might have feared, solely because our ships could outmaneuver them. Next time they will come with a huge fleet of little ships, and they will be a real enemy. We must build a larger fleet, and we can see if the other men have discovered the secret of the projector. Unfortunately, we could not spend more time on those ships, because they were huge gas bombs, and became more explosive each second. We had to leave, and we were sure to find little in so short a time. We must investigate what we have learned."

"Well, I had a very unique experience with the death ray," said Arcot, as he looked at his right arm. "Certainly few people that felt it lived to tell about it. I have been thinking the mechanism over, and trying to discover possibilities. I think I know what the system is.

"You are all familiar with the catalytic effects of light. Hydrogen and chlorine will stand very peacefully in the same jar for a long time, and yet, let a strong light fall on them, and a catalytic effect takes place. They combine with terrific violence. This is the catalytic effect of a vibration, a wave motion.

"Then we have another form of catalysis. We have such things as benzaldehyde, which will oxidize if

standing in the air, and crystallize out as benzoic acid, yet if just a trace of certain other phenyl compounds are present, the reaction is quite completely stopped. This is an example of negative catalysis. It certainly takes no genius to think of combining the two ideas, though it is, of course, considerably less easy to do than to think of. I believe that is the principle of the Nigrian death ray; they simply stop the chemical reactions of a living body, and these are so delicately balanced that the least resistance will upset them. Just see how closely the temperature ranges must be maintained. The human body must maintain the temperature of the brain, and the main nervous system within four or five degrees, or death ensues.

"The Nigrians merely project a ray at their enemies, and the body changes are halted, which makes death instantaneous and painless."

ARCOT halted, and sat puffing furiously a moment; in his discourse, the pipe had died down to an ember, and now he was trying vigorous puffing to restore it. At last he had it going and continued.

"What other weapons they may have we cannot say. The secret of invisibility must be very old to them. But we will guard against the possibility by equipping our ships against it. The only reason the patrol ships aren't equipped already is that the invisibility is useless with modern criminals; they all know the secret and how to fight it."

Arcot referred to the invisibility apparatus that had been invented by Wade — a system of rendering any material perfectly transparent by impressing on it tremendously high frequency electric impulses. It was discovered as early as 1925 that the plate of a radio tube became invisible when working on very short waves. This idea, amplified to the dimensions of the patrol ships, would make them, and everything in them, perfectly transparent. The invisible ship could, however, be located by using a short wave radio receiving set. The directorial set gave an easy method of locating its position, and by projecting a short wave beam in the same direction, the two wave forms—that which was making the ship invisible, and that which the attacker was using—fought each other, and, if the attacker could apply more power than the invisible one, the invisible ship was made visible. In any case it was readily located, and an application of luminous paint to the invisible ship made it permanently visible, for a perfectly transparent ship is not invisible if it shines. The patrol carried invisibility detectors, and luminous paint bombs, but not the invisibility apparatus."

Arcot was puffing steadily at his pipe now, apparently waiting for questions, but each seemed so busy with his own thoughts, stirred up by Arcot's speech, that they remained quiet for some time. Finally Morey spoke up:

"Arcot, we certainly have to get out into space somehow to fight them, but how are we going to do it? I was wondering if we could use Wade's system of storing the atomic hydrogen in solution. That yields about 100,000 calories for every two grams, and since this is a method of storing heat energy, and your molecular motion director is a method of converting heat into mechanical work with 100 per cent efficiency, why not use that? All we need, really, is a method of storing heat energy for use while we are in space."

Arcot was silent a moment before answering.

"I thought of that, and I have been trying to think of other and, if possible, better and cheaper and quicker ways of getting the necessary power.

"Let us eliminate all the known sources one by one. The usual ones, the ones men have been using for centuries, go out at once. The atomic hydrogen reaction stores more energy per gram than any other chemical reaction known. But there are other ways of storing it. Let us take into account all known ways. First there is the storage battery, which is nothing but a chemical reaction. Next is the electro-static condenser, but that does not store any great amount of energy if a practical voltage is used, and there are mechanical difficulties. Then comes the induction coil, which stores electro-magnetic energy. That is far better than the condenser, but it is a method of storing energy in a rather kinetic form, you must maintain the current flowing in it. There is one more form. We must rule out plain heat storage; it is too inefficient. The only other method of storing energy is the method used by the Kaxorians in driving their huge planes. They used condensed light-energy. This was efficient to the ultimate maximum, something no other method can hope to attain. We know that mass is a measure of the energy stored, and in their method they took light, and condensed it, storing its energy by binding one photon to the next through gravitational attraction between individual photons. The ultimate maximum is the amount of energy one gram represents, being fully capable of release, and in this case they got the full four hundred and fifty thousand million million million ergs per pound out of their fuel, but they didn't need more than a pound of fuel all told in those planes. Yet they had huge reservoirs that were needed to store it. The result was still ineffective for our purpose; we want something we can put in a small space; we want to condense the light still further, but that will be the ideal form of energy storage, for then we will be able to release it directly as a heat ray, and so use it with the utmost efficiency. I think we can absorb the released energy in the usual cavity radiator," said Arcot meditatively.

"That's true; I think that is best, but there is still the difficulty that we can't get the power storage apparatus condensed enough. It was the greater flexibility of the small ship that permitted us to win so readily, remember that. The big apparatus would make it very much more cumbersome.

"Then too, there is a second consideration. All that energy has to be gotten from sunlight, practically, and you have to 'charge the batteries,' as with any other kind of a storage device. It would require so long to get the energy collectors built that we would not be fully prepared when the Nigrians return for some more playing. I wonder how long their star is going to be near us?" said Morey junior.

"I thought of the difficulty of storage. I was wondering about the time limit also, and I believe we can solve both, and, into the bargain, have a little laugh at our enemies. What we want is to have that light stored in a more condenser form, a form that is naturally stable, and does not need to be held bound, but requires urging to release. I was wondering—" Arcot paused, smiling questioningly at his audience.

"Oh—Ho—Ha—say that's rare! Whoo—I have to hand it to you—That takes all prizes—have the laugh on our enemies is right!" Wade was laughing so hard he could scarcely speak! In puzzled wonder Morey and the two older men looked at him, and at Arcot who who was grinning broadly.

"Well, it must be funny, but—Oh—I see—say that is good! I see what he means, Dad!" exclaimed Morey turning to his father.

"The light-matter windows we found in the enemy machines contain enough bound light-energy to run all the planes we could make in the next ten years! We are going to have the enemy supply us with the power

we can't get in any other way! I think you do take all prizes for ingenuity, Arcot!"

Dr. Arcot senior smiled at first, then looked dubiously at his son.

"I can see that there is plenty of energy stored there, but, as you said, the energy needs considerable encouragement to break free. How do you expect to do that, Son?"

"I have an idea. I don't know how it will work, but we can try." Arcot puffed at his pipe, rather serious now, as he thought of the problems ahead.

"But Arcot," asked Wade curiously, "how do you suppose they condense that light energy in the first place, and, their sun being dead, whence all the light? I suppose it is from the energy of matter, is it not?"

"I think they break up matter for its energy, but of course I can't say. However, I don't know where else they could get all that energy. As to the condensation problem, I think I have a possible solution of that too; also the same solution applies to the problem of release. We haven't the secret of releasing material energy, but I think we will have before this war is over, if we have anything at all! There is that possibility!" he smiled at them. It was quite possible that man would have neither the secret of material energy, nor the sun, nor life, but there was considerable hope just now. "In any case, we won't need to worry about that for a while."

"How do you think they got their energy loose? Do you think those big blocks of pure silver had anything to do with it?" asked Wade.

"Why, yes, I do think they had something to do with it. Those blocks of silver were probably designed to carry away the power once it was released. The release was accomplished in some way mysterious to me. They solved the greatest problem of the work. You can't light a fire on a barrel of gunpowder very safely. They couldn't use material apparatus to start their release of material energy, the material of the apparatus might 'catch fire' too. They had to have the disintegrating matter held apart from all other matter. This was quite impossible, if you were going to get the energy away by any method, other than by the use of fields of force. I don't think that is the method. My guess is that a terrific current of electricity would accomplish it if anything would.

"How then are we going to get the current to it? The wires will be subject to the same currents. Whatever they do to the matter under consideration, the currents will do to the apparatus—except in one case. If that apparatus is made of *some other kind of matter*, then it won't be affected. The solution is obvious. Take some of the light-matter. What will destroy light-matter, won't destroy electricity-matter; and what will destroy electricity-matter, won't disturb light-matter.

"DO you remember the platform of light-metal, clear as crystal? It must have been exceedingly heavy, too! That was no doubt an insulating platform. What we started as our assumptions in the case of the light-metal, we can now carry further. We said that electricity-metals carried electricity, so light-metals would carry, or conduct light. Now we know that there is no substance which is transparent to light, that will carry electricity by metallic conduction. I mean, of course, there is no substance transparent to light, and at the same time capable of carrying electricity by electronic transmission. We have, of course, things like NaCl solutions in ordinary H_2O which will carry electricity, but here it is by ionic conduction. Even glass will carry electricity very well when hot; when red hot, glass will carry enough electricity to melt it very quickly. But here is just an illustration that glass is not a solid, but a viscous liquid, and it is again carried by ionic conduction. Iron, copper, silver, sodium, lead, all metals carry the current by means of electron drift through the solid substance. In such cases we can see that no transparent substance conducts electricity. Take sulphur, one of the best insulators in the world; it will not conduct electricity, but a sulphur crystal is beautifully transparent.

"Similarly the reverse is true. No substance capable of carrying electricity by metallic conduction is transparent. They are all opaque, if in any thickness. Of course gold is transparent, but only in leaf when it is so thin that it won't conduct! The peculiar condition we reach in the case of the invisible ship is different. There the effects are brought about by the high frequency impressed. But you get my point.

"Do you remember those wires that we saw leading to that little box of the reflecting material? So perfectly reflecting it was that we didn't see it. We only saw where it must be; we saw the light it reflected. That was no doubt light-matter, a light-matter, non-metal, and as such, non-conductive to light. Like sulphur, an electric non-metal, it reflected the base of which it was formed. Sulphur reflects electricity and passes light. This light-non-metal did the same sort of thing; it reflected light, and passed electricity. It was a conductor.

"Now we have the things we need, the matter to disintegrate, and the matter to hold the disintegrating material in. We have two different types of matter. The rest was obvious, but decidedly not easy. They have done it though, and after the war is over, there will still be many machines floating around in space, and I am sure we will be able to learn the secret of material energy."

"Well, Son, I hope you do. But I know that it is time you got working on your problem, since I am officially retired, I am going down stairs. You know I am working in my laboratory with a young man by the name of Norris, and I think we have a method for increasing the range and power of your projector for the molecular motion field. I will show you our math. later, you know there has been little development work done along that line since you did your hurried work on Venus. You had only the simplest kind of calculating machine, and I think we can do a bit better."

"I don't know! Remember that they have been trying to develop that," replied the elder Morey, "but they did such a good job when they did do it, that no one else has improved it since."

"Yes, Dad, what Morey here can do with a simple calculating machine, is a lot more than most scientists can do on a new Brandes-Monsun! I think you probably can improve on it, but you will find that he did a good job!" said Arcot junior. Morey was permanently attached to the three because of his keen mathematical ability. He was able to develop the mathematical facts along the lines Arcot suggested with amazing rapidity, and great ingenuity. He was probably better qualified to convert a mathematical expression into a physical law than any other man in the world. Arcot could see the basic laws, and sketch the physical background, but Morey filled in the gaps with mathematical proof. Wade found his field in chemistry, though his knowledge of physics was decidedly above par.

"In any case, I think we had best get started on our work! It means a lot to save even twenty minutes today!"

The party broke up—the three younger men staying in their own laboratory, while Dr. Arcot senior went down to his laboratories.

"Oh, Mr. Morey," called out Arcot, "before you leave,

I want to ask you if you can spare Fuller again, since you have finished the work on the molecular motion fleet, I am sure he will be able to help a lot here, and it is really his right to design the first of these new space ships!"

Fuller had been with these men in each of their adventures since the original development of the molecular motion ship. He had designed the first of them, the first little ship that had shown the power of the molecules in motion, and he had designed the first Air Liner working on a new principle. He had drawn up the plans for the "Solarite," the first interplanetary ship of the system. Certainly he had every right to be "in on" this new advance. Mr. Morey, for whom Fuller had been designing the fleet of molecular motion ships, gladly gave his approval. The foremost designer of the country, he should certainly be working with these men, the foremost scientists of the country, if not of the system.

After they had left, Arcot suggested that Wade and Morey start attacking that plate of crystal, in an attempt to tear off a small piece, on which they might work. In the meantime he went into the televisophone room and started to put through a call. He wished to get in touch with the Tychos observatory, the great observatory that had so recently been established on the frigid surface of the little dead world, the Moon. The huge mirror, ten feet in diameter, allowed of immense magnification here, and stellar observations were greatly facilitated, for no one bothered them, and the "seeing" was always good.

However, the great distance was rather a handicap to the ordinary televisophone stations, and all calls put through to it had to be made through the powerful sending station in St. Louis, where all interplanetary messages were sent and received, while that side of the Earth was facing the station, and from Constantinople, when that city faced the destination. These stations could bridge the distance readily and clearly.

For several mintutes Arcot waited while the connections were being established for the Moon; then for many more minutes he talked earnestly with the observer in this distant stations, and at last satisfied, he hung up.

For some time he had outlined his ideas concerning the Black Star to the men in charge; then he had asked that they investigate the possibilities, and see if they could find any noticeable effects on the planets.

Finally he returned to where his friends had been working on the crystal plate. Wade had a most decidedly exasperated expression on his face, and Morey was grinning broadly.

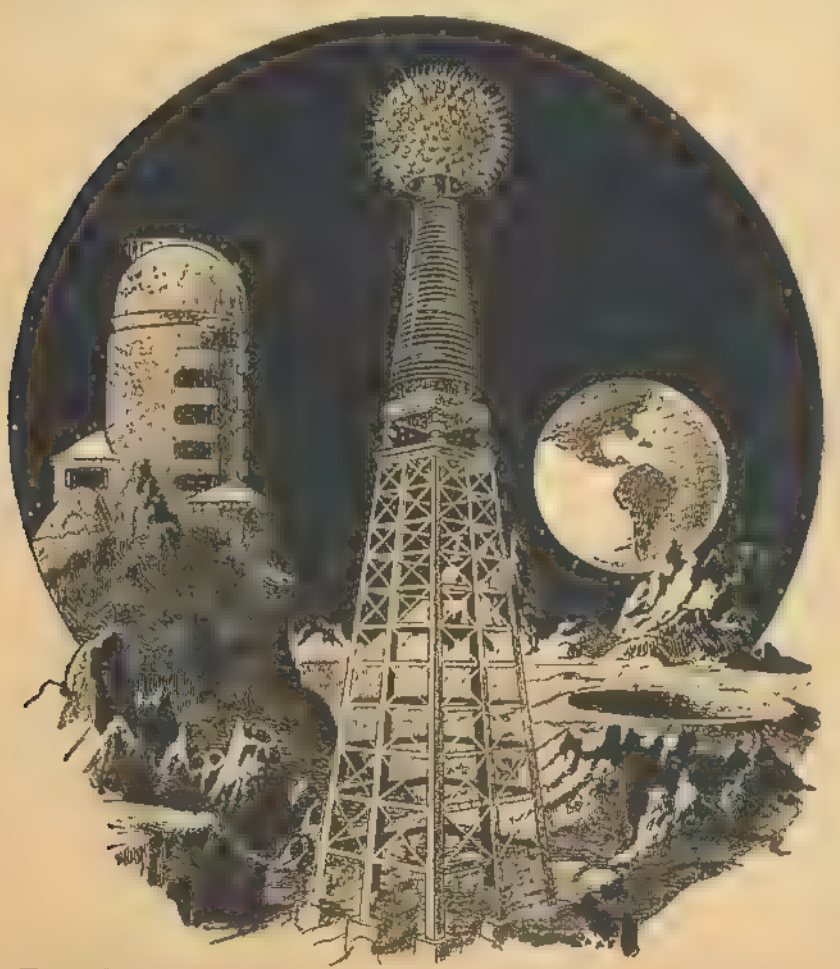
"Hello Arcot—you missed all the fun! You should have seen Wade here working on that plate!" The plate had, in his absence, been twisted and bent, showing that it had undergone some terrific stresses. Having some idea of the strength of the material, Arcot could appreciate what forces must necessarily have been used. Now Wade began to make certain remarks about the properties of the plate in language that was not exactly scientific. It was more the language of a mechanic who has just released the power of the molecular director ray of his machine, only to discover it does not work, and that his last two hours' labor proved fruitless.

"Why, Wade, you don't seem to like that stuff. Perhaps the difficulty lies in your treatment, rather than in the material itself. I think I can show you how to do it. What have you tried?"

"Everything! I took a coronium hack saw that will eat through molybdenum steel like so much cheese, and it just wore its teeth off. I tried some of those diamond rotary saws you have, attached to a small electric motor, and it wore out the diamonds. That got my goat, so I tried using a little force. I put it in the tension testing machine, and clamped it—the clamp was good for 10,000,000 pounds—but it began to bend, so I had to quit. Then Morey held it with a molecular ray, and I tried twisting it. You know it gave me real pleasure to see that thing yield under the pressure. But it is not brittle; it merely bends.

"And I can't cut it, or even get some shavings off the darned thing. You said you wanted to make a Jolly balance determination of the specific gravity, but that stuff is so dense you would need only a tiny scrap, and I can't break that loose!" Wade looked at the thing in greatest disgust. He would have liked to kick it, but he knew it was heavy, and very hard, so he did not.

Arcot smiled at him; he could understand his feeling, for the stuff certainly was stubborn with any tools they had in their command. "I'm sorry I didn't warn you fellows about that, but I was so anxious to get that call through that I forgot to tell you how I expected to make it more workable. Now, if Wade will get another one of those diamond-



He wished to get in touch with the Tychos observatory, . . . that had so recently been established on the frigid surface of the little dead world, the Moon.

tooth rotary saws, I'll get something that may help. Please put the rotary saw on the *air* motor. Use the one made of coronium."

WADE looked after the rapidly disappearing Arcot in rather considerable surprise, then, scratching his head, he turned and started to do as Arcot had asked.

Arcot returned in about five minutes with a small handling machine, and a huge magnet. It must have weighed nearly half a ton and looked quite capable of changing the north magnetic pole of the earth. This he quickly connected to the heavy duty power lines of the lab. Now, running the handling machine into position, he quickly hoisted the bent and twisted plate to the poles of the big magnet, with the aid of the derrick.

Then he backed the handling machine out of the way, and finally returned on foot.

"Now, we'll see whether or not we are going to win this war!" said Arcot, smiling a bit. He stepped over to the big magnet and switched on the current. At once a terrific magnetic flux was set up through the light-metal. Then he took the little compressed air saw, and applied it to the crystal plate. The smooth hiss of the air deepened to a whine as the load came on it, then the saw was scraping on the hard plate.

To Wade's surprise and joy he saw the little diamond-edged saw bite its way slowly but steadily into the heavy plate. In a moment it had cut off a little corner of the light-matter, and this fell with a heavy thud to the magnet pole, drawn down both by the attraction of the magnet and by gravity.

Arcot at once shut off the magnet, and stepped back. Then he picked up a pair of pliers, and gripped the little chunk of light-metal.

"Whew—this may be light-metal, but it certainly is not light metal! I think this little scrap weighs nearly ten pounds! We will have to reduce it considerably before we can use it. I think we can handle it now though!"

By using the magnet and several large diamond face-plates, gotten from the great diamond mines on the moon, they were able to work the tough material down to a thin sheet; then, with a heavy press, they cut some very small fragments, and with these, determined the specific gravity.

As Wade watched the little plates of light-metal spread out under the hard diamond face-plates, and flattening nicely he looked at them in wonder. He seemed surprised that anything could be done with the material.

"Arcot," he began at last, "just how does that magnet make that stuff tractable? I can see how it might attract it, but I am not physicist enough to see how it can soften it. It may release some of the binding gravitation, but I know that magnetic and gravitational fields, while Einstein has shown that they are similar, are not identical, and they aren't mutually influential. Now I don't see how this affects the stuff."

"I wasn't sure it would, but it was somewhat of a hunch. The reason it will affect it, is, that the light-matter in every photon is affected by the magnetism, and every photon is given a new motion. That stuff can be made to go with the speed of light, you know. It is the only solid that could be so affected. This stuff would be able, with the aid of a molecular motion beam, which will make all the photons move in parallel paths, to move at the full speed of each photon, 186,000 miles a second. The tremendous speed of these individual photons is what makes the material so hard. Their kinetic impulse is rather considerable! It is the kinetic blow that the molecules of a metal give that keeps other metals from penetrating it. This simply gave such terrific impulses that even diamonds wouldn't cut it. Now you know that an iron saw will cut platinum very readily, yet if they are both heated to a temperature of say, 1600 degrees, the iron is a liquid, and the platinum very soft, but now it cuts through the iron readily! The heat softens them.

"Heat will probably have no effect at all on this, but the effect of the magnet on the individual photons corresponds to the effect of the heat on the individual atoms and molecules. The mass is softened, and we can work it. I think that is the explanation; that, at least, is the reason for my original belief that I could soften the stuff electro-magnetically.

"But Wade, I wish you would see if you can get the density of this stuff. You are more used to those determinations and that type of manipulation than we are. When you get through, we may be able to show you some results also!"

Wade picked up a tiny chip of the light-metal, and started off toward his own laboratory. Here he set up his Jolly balance, and set to work on the tiny fragment. His results amazed him. The readings on the delicate spring when in water, and when out, were so vastly different, it seemed incredible that a substance could be so dense. At last he returned to the main lab, where Arcot and Morey were working rapidly at a large, and complicated electro-static apparatus.

"What did you find?" called out Arcot, as he saw Wade enter the room. "Tell us your results, and in the meantime lend a hand here, will you? I have a laboratory scale apparatus of the type the Kaxorians used in the storage of light. It has been known to them, ever since they began the work on it, that their machines would release the energy with more than normal violence, if certain changes were made in it. That is, the light condenser, the piece of apparatus that stored the photons so close to each other, would also serve to urge them apart. I have made the necessary changes in the apparatus, and I am now trying to set it up to work on solid light-matter. The machine was developed for gaseous light-matter, and it is a little hard to change it over. I think we will have it in a minute. Wade, will you connect that to the high frequency oscillator there—no—through the counterbalanced condenser there. We may have to change the oscillatory frequency quite a bit, but I think we can do it. What results did you get?"

"I don't know whether to trust the results or not," was the answer. "I think we had best use the regular volume and weight method rather than the Jolly balance. Of course the stuff must be heavy—but I still think—well, anyway, I got a density of about 103.5!"

"Whewww—103.5! Lord! That is almost five times as heavy as the heaviest metal hitherto known, osmium is about 22, isn't it? That makes osmium about ten times as heavy as aluminum, and over twenty-five times as heavy as sodium metal. Certainly there is no good reason why we shouldn't have a substance four times as heavy as it! A hundred and twenty or thirty times as heavy as postassium and sodium!

"There was about half a cubic foot of the material, too; that would mean about 4000 pounds for the whole mass, or two tons. There is good reason why we couldn't lift the plate!" The men had all stopped their work on the apparatus to discuss the amazing results of the density test, but now they fell to again, rapidly assembling the apparatus, for each was a trained experimenter, and though Wade usually devoted his time to chemistry, since in this group he shone better in that field, nevertheless, he was a brilliant physicist, and he would easily have been able to hold his own in most scientific gatherings.

"I think we will have enough urge to disintegrate right here, but I want to make sure, and so, before we set up the case over it, I think we may as well put that big magnet in place, and have it there to help in the work of disintegration, if need be," suggested Arcot, and so they placed the heavy mass as quickly as possible, the little handling machine swinging it into place for them.

AT last the complete apparatus was set up, and the tiny bit of light-matter they were to work on was set up on the table of a powerful Atchinson projector microscope, the field of view being in the exact center of the field of both the magnet and the coil.

"Well, we are ready," said Arcot, as he placed the projector screen in position, and dimmed the lights in the room. A touch of the switch, and the projection screen was illuminated with the enlarged image of the tiny scrap of light-metal. "Now let's see what happens. There is the obvious possibility that instead of releasing the energy gradually as I expect, it will do it all at once, and we will have a beautiful little explosion. I should say it would be intense enough to wreck the three top floors of the building. That probably weighs three milligrams.

"Before starting this experiment, I called up Dr. Manning, of Chicago, and told him what I was doing. He knows the line of research, so if anything happens to us, the work will not be greatly delayed. Here goes!"

Arcot placed his hand on the switch, and smiling at his friends, closed it. This put the powerful Arcot oscillator tubes into action, and the power was ready for application.

Slowly he closed the rheostat and put the power into the coil. The little plate of metal on the slide seemed to throb a bit, and its outline grew hazy, but at last Arcot had full power on and the release was so slow as to be imperceptible. "Guess we need the magnet after all; I'll put it on this time," Arcot said.

He opened the coil circuit and closed the magnet circuit at half voltage, then again he increased the current through the rheostat. This time the plate throbbed quite violently, then suddenly it seemed like a bit of iodine. The dense vapors suddenly began pouring from it, and instantly those vapors became a blindingly brilliant flood of light. Arcot had snapped open the switch the moment he saw this display start, and it had had little time to act, for the instant the circuit was opened it was forced to subside. But even in this interval of time, the light aluminum screen had suddenly become limp and slumped down, molten! The room was unbearably hot and the men were nearly blinded by the intensity of the light.

"It works!" It works! That sure was hot too—it is roasting in here—open the window, will you Arcot!" yelled Wade. That display meant that Earth and Venus would have space ships with which to fight space ships! There was reason for their joy!

Though they had made a great deal of progress already, there was still a great deal of development work to be done. They must attain an accurate system of control for the release of the energy, and they must have it under accurate and instantaneous control, a control they could trust to take care of the terrific energy at their disposal, for if it were to be used in a ship it must be practically automatic.

Fuller arrived later that afternoon and found the three friends already at work in developing a more compact and scientific apparatus than the stray bits of apparatus that had gone into making that first release mechanism.

"And so you can see," said Arcot, as he finished his explanation of progress so far, "we still have plenty of work for you to do, Fuller. I am now trying to find some data for you to work on, but I can tell you this: we will need a ship that has plenty of strength and plenty of speed. There will be the usual power plant, of course; the generators, the power-tube board, and the electro-magnetic relay controls for the regular molecular motion controls. Then, in addition, we must have the regular controls for the ray projector, and that too must wait a while, for Dad is working on a projector which has a range nearly twice as great as what we have developed heretofore. The main difficulty has been that the ray wouldn't stay a ray, but spread out. He has gotten his director field so intense that the ray is nearly perfectly a cylinder, and not a cone.

"Then we will have the driving units inside the ship now, for all our power will come from the energy of the light-matter.

"There will be one new weapon, though. I suppose it won't be exceedingly effective, for any polished surface reflects heat, but we can try using the beams of light we release from the light-matter as a heat wave. What do you think about it, Morey?"

"Well—to be frank, I don't think much of it. I think it would be a waste of time and material to even install a heat ray. They would be far less efficient than our molecular motion ray. I think we had best just let them alone. I have been wondering how you expect to use the light energy, though; that is what the exact absorption mechanism will be, by which you expect to get the light energy transferred to the driving mechanism," replied Wade.

"I think the easiest way to do that is to use the ordinary cavity radiator type absorption chamber, that is 100 per cent efficient. The molecular ray being 100 per cent efficient, that means we will have a perfect machine!"

"Maybe so, Arcot," interrupted the designing engineer, "but I don't know all the physical terms you use!"

"Well, a cavity radiator is a mechanism whereby all frequencies of radiation are emitted proportionately. You know, Fuller, there is no single substance that radiates in the ideal way. A black body will radiate all frequencies perfectly indiscriminately, just as it will absorb all frequencies indiscriminately. The ideal black body cannot be had, but we can see that a perfect absorbing thing could be got at. What we want is a surface that will absorb all of every bit of light or heat or ultra-light that strikes it. Suppose we imagine the surface to be the surface of the hole in the neck of an earthenware jug. There is no surface there—it is a hole—but it fulfills all the other conditions, and acts as our imaginary surface would. It does, obviously, absorb everything that strikes it, for there is nothing to prevent it, and once inside, the chance of the light getting back out again is so infinitesimal that we can neglect it, for it is reflected and re-reflected from side to side. Each time the rough, dark surface takes its toll, and less light is left. In practically zero time, the light has been 100 per cent absorbed. Now I propose to absorb the energy for the ships in a big sort of thermos bottle, working on that idea. The fact that light will heat anything it strikes, is, of course, obvious, so what we will have will be a bottle-shaped cavity like this, with the neck here, and just in front of the neck a light-matter destruction apparatus, which will send all the released light energy into the cavity. The cavity itself will be painted black inside. We will use some rough black surface and this will absorb all the light energy, immediately converting it into heat energy. That is, the steel bottle here will become very warm if left undisturbed, but the steel bottle will be

double, and we can have a considerable quantity of helium in the space between the double walls of the 'thermos bottle.' The gas will be on the field of the molecular motion director and will be very cold, and will promptly absorb the heat of the steel bottle; thus our driving unit is ready!

"We will need one main horizontal unit for driving the ship forward or backward and for braking, and there will be three smaller vertical power units, controlled as usual, so we can have the desired angle of climb or vertical ascent, and three horizontal power units for turning and moving sideways. That makes one big and six small units. In space we will need all three dimensions equally, and so the sum-power of the three small ones must equal the power of the main horizontal driving unit.

"Then there must be a generator aboard to generate the power for the power tube banks, and for the magnet for releasing the light energy, as well as the electro-static oscillator. The generator will be of the usual type, driven by power units on the rim of the drive wheel, and these can be warmed by heating their atmosphere; that will be easy enough.

"There will also have to be heating devices for warming the ships, for they may have to go out into interstellar space. I have a notion we may pursue the Nigrians all the way to their home planets, to make sure they stay right there until their star has passed entirely out of our region. At any rate, they must have heating devices to warm them when they are as far from the sun as old Neptune, and we certainly will have to go that far. It was all right for us to go without any heating apparatus in the *Solarite* for then we were as near, or nearer the sun than Earth is, and hence our temperature was maintained by the sun, but out there in space, the sun will be so far away that we won't feel its rays, and if we do go to the Black Star, we will certainly feel the absence of heat. Of course, space has tremendously hot molecules in it. But there are so few molecules there that we won't get any heat from them. That device will, however, be simple enough.

"The ships must be capable of about six or seven thousand miles a second, and that implies all the acceleration a human being can endure. Since I expect to make long trips in them, I think we will do best if we make several types of ships. Three should suffice: a small single man cruiser, with no bunk or living quarters, just a little power plant and weapon. One that can jump out of the way of a ray so quickly that it will be very hard to hit, and at the same time, because of its ray, be very dangerous. There will have to be some place for the operator of this ship to sleep and eat. I think the easiest way to solve that is to have a large fleet of mother ships—ships with a twenty-man crew, but still very active, and very deadly. These should have bunks and living quarters for the crew. Some men would be sleeping in the bunks all the time. The men could take turns running the one-man ships and sleeping. There will also be some ten-man scout cruisers. These will be used in the same way, but will have a smaller fleet of ships dependent on them.

"We have as yet found no prospect of success in insulating against the death ray; their negative catalysis ray seems to pass right through metal if powerful enough, as it evidently is in the ship projectors, but we can't carry enough metal armor to stop it. I think our ray is more effective in any case.

"But now let's get back to work, and you can see what you can find, Fuller. I think you might call in the engineers of all the big machine manufacturers and have them ready to start work at once when the plans are finally drawn up. Their help will make the job quicker. You had best get in touch with all the Venerian men, too. Those new works in Sorthol, Kaxor, will certainly handle a lot.

"I suppose the Interplanetary Patrol men will want to have something to say, though they are usually pretty reasonable about taking the verdict of the scientists. They will have to be called in too, I suppose. You will have to wait to begin the actual work, but we will get our job done now, just as quickly as we can." As Arcot finished, he rose, and with Wade and Morey went toward the door. Fuller at once agreed, and headed for the televisophone room.

THE three physicists at once started their work on determining the approximate factors that controlled the release of the energy. Accurate work could not be done at once, but four significant figures in their results were probably more than enough.

Despite their utmost endeavor and the hard work of all the men of the two worlds, it was nearly six weeks before the fleet had grown to a thing of real importance. The tests they subjected the tiny ships to had been more than satisfactory. They behaved wonderfully, shooting about at terrific speed, and with all the acceleration the men could stand. They had developed a special Rocket Squad, a group of men with unusual ability to withstand the effect of the acceleration, and this squad had immediately been given the new machines and had been put in training. They were able to move with terrific speed, and get there before any other group. The strain was frequent enough to make the applicants become unconscious, but they quickly developed the muscles that had been unused for so many ages, since man began to walk upright, and they soon were able to stand even greater accelerations. This rocket squad was composed almost solely of Terrestrians, for they were used to the greater gravity of Earth, and could stand greater acceleration strains than could Venerians.

The ships were each equipped with an invisibility locater, a sensitive short-wave directional receiver, that would permit the operator to direct his rays at invisible targets. The ships themselves could not be made invisible, for they depended in their very principle on the absorption of light-energy. If the walls of every part of the ship were perfectly transparent, they could absorb no energy at all, and they would still be plainly visible—even more so than before! They must remain visible, but they would also force the enemy to remain visible. Each ten-man ship carried an old-fashioned cannon that was equipped to hurl canisters carrying the luminous paint. They had decided that these would have advantages, even if the ships were not made invisible, for in space a ship is visible only because it reflects or emits light. For this reason, the ships were not equipped with any portholes except in the pilot room and in the observation posts. No light could escape. To reduce the reflection to the absolute minimum, the ships had each been painted with an absolutely black pigment. In space they would be exceedingly difficult targets.

The heating effect of the sun on the black pigment when near the great star was rather disagreeably intense, and to cool the little ships they had installed molecular director power units, which absorbed the heat in acting to drive the ship. The dark surface also radiated far more rapidly than would a polished one, but they could easily warm their ships when too far from the sun.

Each of the little ships, the one-man machines, was equipped with a small machine-gun shooting luminous paint bullets. One of these bullets, landing on a machine, made it visible for at least two hours, and

as they would cover an area of perhaps thirty square feet, they were decidedly effective.

It was found that ray practice was rather complicated. The government had had ranges set up in the great mountain districts, away from any valuable property, but they soon found that even this was not enough. The rays very quickly demolished the targets, but they were not satisfied with that, and already showed very good progress toward demolishing the mountains as well. Since they had built all the ships with the molecular director ray only, training became a real problem. The few ships that had been made before the great war came, were not representative of the new ones, and they alone were equipped with the light-ray-training projectors. They could not afford to waste time making the light-projectors, so the problem was solved by using the barren surface of the moon and the little planetoids beyond Mars and Mars itself, as a proving ground.

The trips out into the outer limits of the Solar System were true trips of exploration, for these were the first ships to get so far from Earth. The slow-moving solar power ships were still struggling over the belt of asteroids in most cases. The terrific danger from the many little planets here had made it impossible to continue their outward course in the plane of the system, but had forced them to fly "above" it. The Solar System is like a great spinning wheel, all its parts lie in practically one plane and the planets revolve in orbits in that plane. The asteroids are in a flat ring about the sun, like the rings of Saturn, and all that was necessary to pass them was to leave the plane of the system and fly "above" them, dropping back to the plane on the other side of the menace. It was like passing a two-dimensional wall; just go over it in the third dimension. But this passing had been long and cold for the men in the solar power ships, and if anything went wrong with their power plant, they would be forced to remain there forever, for they would be caught in the orbit.

THE ships were sent out in squadrons as fast as the ships could be finished, and the men could be brought together and trained. They were establishing a great shield of ships across all that section of the system whence the Nigrians had appeared, and they hoped to intercept the next attack before it reached Earth, for they well knew that the next attack would be in full force.

Arcot had gone to the conference held on Venus with the other men who had investigated the great wrecks, and each scientist had related his view of things and his ideas. Arcot's idea of the black star was not very favorably received. As he had explained to Wade and Fuller, who had not gone, there was good reason for it. Though the scientists were all ready to admit that these men must have come from a great distance, and they agreed that they lived in an atmosphere of hydrogen, and judging from their pale skins, that they were not used to the rays of a sun, still they insisted on the theory of an outer planet of the sun.

"You remember," explained Arcot, "several years ago there was a considerable discussion about the existence of a planet still further out from the sun than Neptune. It is well known that there are a number of irregularities in the orbits of the outer two planets that can't seem to fall under the explanation applicable to the other planets, and an outer planet could be given the necessary mass and orbit to do the things they observe.

"This attack from outer space was immediately taken as proof of that theory, and it was very easily supported, too. My one good point that stood for any length of time under their attacks was the fact that those ships weren't developed in a year, nor a century, and that the chemical constitution of the men was so different. There were no new elements discovered, except the light-matter, but they are rather wondering about the great difference of earthly chemical constitution and the constitution of these invaders.

"They had one argument that was just about enough to throw mine out, though they pointed to the odds against the thing happening. You know, of course, how a planet is formed? They are the results of tidal action on two passing suns.

"You can imagine two mighty stars careening through space and then drawing slowly nearer, till at last they come within a few billion miles of each other, and their gigantic masses reach out and bind them with a mighty chain of gravity. Their titanic masses swing about each other, each trying to pull free, and continue its path about the center of the galactic system. But as their huge bulks come nearer, the chains that bind them become stronger and stronger, and the tremendous pull of the one gargantuan fire ball on the other raises titanic tides of flame, great streamers of gas shoot out into space, and all the space about is lighted by the flaming suns, their usual tremendous activity stirred up as by a giant poker, and even more fuel is heaped on their fires. The pull of gravity becomes more and more intense, and as the one circles the other, the tide is pulled up, and the mighty ball of fire, which, for all its existence has been practically motionless as far as rotation goes, begins to acquire a greater and greater rotational speed as the tidal drag urges it on. The flames begin to reach higher and higher and the tides, now urged from the sun by centrifugal force, rise still greater, and as the swinging suns struggle to break loose, the flaming gas is pulled up and up, and becomes a mighty column of fire, a column that reaches out across three—four—a dozen millions of miles of space and joins the two stars at last, as the stalactites and stalagmites grow together. A flaming tie of matter joins them, two titanic suns, and a mighty rope of fire binds them, while far mightier chains of gravity hold them together.

"But now their original velocity reasserts itself, and having spiraled about each other for who can say how long—a year—a million years seems more probable—but still only an instant in the life of a star, they begin to draw apart, and the flaming column is stretched out, and ever thinner it grows, and the two stars at last separate. But now the gas will never fall back into the sun. Like some giant flaming cigar it reaches out into space and it will stay thus, for it has been set in rotation about the sun at such a speed as is needed to form an orbit. The giant mass of gas is, however, too cool to continue to develop energy from matter, for it was only the surface of the sun, and cool. As it cools still further, there appear in it definite condensations, and the beginnings of the planets are there. The great filament that stretched from sun to sun was cigar-shaped, and so the matter is more plentiful toward the center, and larger planets develop. Thus Jupiter and Saturn are far larger than any of the others. The two ends are tapering, thus Earth is larger than Venus, which is larger than Mercury, and Uranus and Neptune are both smaller than Saturn.

"Mars and the asteroids are hard to explain. Perhaps it is easier to understand when we remember that the planets thus formed must necessarily have been rotating in eccentric orbits when they were first born, and these planets came too near the sun while gaseous, or nearly so, and Mars lost much of its matter, while the other, which now exists only as the asteroids, broke up.

"But now that other flaming star has retired, wan-

The ships behind it, unable to stop so suddenly, piled up on it in chaotic wreckage! A vast halo of shining gas spread out fifty thousand miles about.

dering on through space. The star has left its traces, for behind it there are planets where none existed before. But remember that it, too, must have planets now.

All this happened some 2,000 million years ago.

"But in order that it might happen, it requires that two stars pass within the relatively short distance of a few billion miles of each other. Space is not overcrowded with matter, you know. The density of the stars has been compared with twenty tennis balls roaming about the 8,000-mile sphere that the Earth fills up—twenty tennis balls in some 270 billion cubic miles of space. Now imagine two of those tennis balls—with plenty of room to wander in—passing within a few yards of each other. The chances are about as good as the chances of two stars passing close enough to make planets.

"Now let us consider another possibility.

"The Black Star, as I told you, has planets. That means that it must have thus passed close to another star. Now we have it coming close to another sun that has been similarly afflicted. The chances of that happening are inconceivably small. It is one chance

in billions that the planets will form. Two stars must pass close to each other, when they have all space to wander about in. Then those afflicted stars separate, and one of them passes close by a new star, which has thus been similarly afflicted with that one chance in billions—well, that is then a chance in billions of billions.

"So my theory was called impossible. I don't know but what it is. Besides, I thought of an argument the other men didn't throw at me. I'm surprised they didn't too—the explanation of the strange chemical constitution of these men of a solar system planet would not be so impossible. It is quite possible that they live on a planet revolving about the sun which is, nevertheless, a planet of another star. It is quite conceivable to me that the chemical constitution of Neptune and Uranus will be found to be quite different from that of the rest of our planets. The two filaments drawn out from the suns may not have mingled, though I think they did, but it is quite conceivable that, just before parting, the sun tore one planet, or even two or three, from the other star.

"And that would explain those men.

"My other ideas were accepted. They agreed on the idea of the release of material energy, and the source of their power, but they couldn't agree with me on that!" Arcot puffed at his pipe meditatively for several moments, then stood up, and stretched.

"Ho—I wish they would let me go on active duty out there!" he grinned at his friends. He had been rejected very emphatically when he tried to enlist in the air patrol. The Interplanetary Governments had decided flatly that he was needed too much as a scientist to go as a pilot of a small ship.

And over all the worlds of the Solar System the great construction plants were humming with activity. The great shops were turning out the new machines at top speed, and getting their fuel from the wrecks of the great Invaders' ships. Each machine needed only a little, however, for the energy content was so immense. And those ships had been very big.

ALREADY there was a fleet of the little ships out there in space, and with every passing hour other ships left for the patrol, always adding to the fighting force that was to engage the attacking force deep in space, where no stray ships might filter through to destroy the cities of Earth or Venus. The plants were now turning out ships at such a high rate that the training of their operators was the most serious problem, and one that had been finally solved by a very abbreviated training course in the actual manipulation of the controls on the home planet, and subsequent training as the squadrons raced on their courses away from Earth. The beams used were molecular motion beams, modified however, so that they did not affect the molecules, and their presence was detected by the ionization they would produce in the atmosphere within the ship. A small electroscope was kept charged. The ray would discharge this and the men would then signal the "enemy" that a hit had been scored. In this way actual spacial warfare was carried on in practice. The training was far more valuable than any number of hours of terrestrial training, for here no ionization would serve to show the path of the rays.

It was soon decided that there must be another service besides that of the ordinary ships. One plant was devoted to making huge interstellar liners. These ships were made nearly a quarter of a mile long, and while still diminutive in comparison to the giant Nigrian ships, they were still decidedly large. But twelve of these could be completed within the next month, it was found, and one of these must be used as an officers' headquarters ship. It was quickly recognized that the officers must be within a few hundred thousand miles of the actual engagements, for light traveled 186,000 miles a second, and they must very frequently make decisions in less than a half minute. If a message were to be sent to Earth and returned, as long as two hours for each direction was required.

The ship must not be brought too near the front lest the officers be endangered and the entire engagement lost for want of the organizing central headquarters. The final solution had been the huge central control ship.

The other large vessels were to be used to carry food and supplies. They were not to enter the engagement, for their huge size would make them as vulnerable to the tiny darting mites of space as the Nigrian ships had been to the Interplanetary Patrol. The little ships could not conveniently stock for more than a week of engagement, then drop back to these warehouses of space, and go forward again for action.

Throughout the long wait the officers of the Solarian forces organized their forces to the limit of their ability, planning each move of their attack. Space had been marked off into a great three-dimensional map, and each ship carried a small replica, the planets moving as they did in their orbits. The space between the planets was divided off into definite points in a series of Cartesian co-ordinates, the sun being the origin, and the plane of the elliptic being the X-Y plane.

The OX line was taken pointing toward one of the brightest of the fixed stars that was in the plane of the elliptic. The entire solar system was thus marked off as had been the planets long ages before, into a system of three dimensional latitude and longitude. This was imperative, in order to assure the easy location of the point of first attack, and to permit the entire fleet to come into position there. A scattered guard was to remain free, to avoid any false attacks and a later attack from a point millions of miles distant. Earth and Venus were each equipped with gigantic ray projectors, mighty ray guns that could destroy anything, even a body as large as the moon, at a distance of ten thousand miles. Still, a ship might get through, and with the death ray—what fearful toll might be exacted from a vast city such as Chicago—with its thirty millions! Or Karos, on Venus, with its fifteen and a half millions?

The tension became greater and greater as, with each passing day, the men grew to expect the call from the far-flung guard. The main bulk of the fleet had been concentrated in the center of their great spherical shell of ships. They could only wait—and watch—and prepare! Hundreds of miles apart, yet near enough so that no ship of any size could pass them undetected, and behind there were ships with delicate apparatus that would detect any foreign body of any size whatever anywhere within a hundred thousand miles of them. But these ships could not be successfully operated when near each other, so over all space they reached, scattered about 75,000 miles apart.

The Solar System was prepared to repel boarders from the vast sea of Space!

* * *

TAJ LAMOR gazed down at the great place below him. In it there was close packed a great mass of ships, a concourse of Titans of Space, great space ships, ships that were soon to set out to win not a nation, not even a world, but to conquer a system, and to win for their owners a vast new sun, a sun that would light them, and heat them for long ages to come.

He gazed down at the vast metal hulls glistening softly in the dull light of far-off stars, and artificial

lighting system. From the distance came to him the tapping and the humming of the working machines below as they strove to put to the great ships the last touches.

He raised his eyes to gaze at the far-off horizon, where a great yellow star flamed brilliantly against the black velvet of space, for their atmosphere was too thin to color the sky.

Thoughtfully he gazed at the flaming yellow point.

He had much to consider now. They had met a new race, a race of barbarians in some ways, yet they had not forgotten the lessons they had learned; they were not decadent. Between his æon-old people and their new home stood this force of strange men, a race so young that its age could readily be counted in millenniums, but withal a strong, intelligent race. And to a race that had known no war for so many æons, it was an unthinkable thing that they must kill other living intelligent beings in order that they might live. They had no need of moving, some men had argued, they might stay where they were forever, and never find any need for leaving their planet. Their worlds would never change now. What reason had they to kill off this other race? These were the decadent sons of a mighty race speaking, and Taj Lamor had grown to hate that voice. But there were other men, men who had gone to that other world, men who had seen vast oceans of sparkling, clear water, showering from their ruffled surfaces the brilliant light of a great, hot sun, and they had seen towering masses of mountains that reached high into the blue sky of a natural atmosphere, their mighty flanks clothed with a lush-green growth; natural plants in abundance!

Their eyes had looked down on the sparkling beauty of that sapphire jewel of liquid in its wondrous setting of green, and the blue of air behind.

And best of all, they had fought and seen action, such as no member of their race had known in untold ages. They knew Adventure and Excitement, and they had learned things that no member of their ancient race had known for long æons. They had learned the meaning of advancement and change. They had a new ardor, a new strength, a new emotion to drive their arguments across, and those who would have held them back became enthusiasts themselves. Enthusiasm may be contagious, but the spirit of their decadence was rapidly failing before this new urge. Here was their last chance and they must take it; they would!

They had lost many men in that battle on the strange world, but their race was intelligent; they learned quickly; the small ships had been very hard targets, while their big ships were too easy to strike. They must have small ships, yet they must have large ships for cargo, and for the high speed driving apparatus. The small ships were not able to accelerate to the terrific speed needed. Once their velocity had been brought up to the desired value, it was easy to maintain it with the infinitely small friction of space as the only retarding force; one atom per cubic inch was all they must meet. This would not hold them up, but the great amount of fuel and the power equipment needed to accelerate to the desired speed could not be packed into the small ship. Into the vast holds of the huge ships the small ships were packed, long shining rows of little metal ships. Tiny they were, but they could dart, and twist and turn as swiftly as could the ships they had met on that other world—tiny ships that darted about with incredible suddenness, a target that seemed impossible to hit. These ships would be a match for those flashing motes, the ships of the Yellow Sun. Now it might be that their great transport and battle ships could settle down to those worlds and arrange them for their own people!

And they had discovered new weapons, too. One of their mightiest was a new apparatus, one that had been forgotten for countless ages. A model of it was in existence in some forgotten museum on a deserted planet, and with it long forgotten tomes that told of its principles, and of its consequences. Invisibility was now at their command. It was an ancient weapon, but might be exceedingly effective!

And one other. They had developed a new thing! They had not learned of it in books, it was their invention! They did not doubt that there were other machines like it told of in their museums, but the idea was original to them. It was a beam of electrical oscillatory waves, a beam of what we would call radio waves, projected with thousands of horsepower of energy, and it would be absorbed by any conductor. They could melt a ship with this!

And thus that great courtyard had been filled with Giants of Space! And in each of these thousand great warships there nestled three thousand tiny one-man ships. A thousand five hundred miles the great metal bulks alone would stretch, and with them would go a great swarm of tiny stinging ships, like some horde of stinging wasps swarming about their nest.

Here was a sight to inspire any race!

Taj Lamor watched as the last of the working machines dragged its slow way out of the great ships. They were finished! The men were already in them, waiting to start, and now there was an enthusiasm and an activity that had not been before; now the men were anxious to get that long journey completed and to be there, in that other system!

Taj Lamor entered his little special car and shot swiftly down to the giant bulks. Now he was stepping out of his little car, and walking over to the tube transite, ready for the trip to the nose of the giant ship. Behind him other men were quickly moving his little car to a locked cradle berth beside long rows of similar cars.

A quarter of an hour later the people who were to remain here on this planet saw the first of the monsters of the space rise slowly from the ground and leap swiftly forward, then, one every ten seconds, the others leapt in swift pursuit, rushing swiftly across half a world to the giant space lock that would let them out into the void. In a long, swift column of sweeping ships they rushed on. Then one at a time they passed out into the mighty sea of space, Pirates of Space! From one system, careening on its way through the void, they were sweeping out to another system, to take it, and overrun it with their people! In space they quickly formed and set out.

As by magic, far to the left of their flight, there suddenly appeared a similar flight of giant ships, and then, to the right, and above, another seemed to leap out of nothingness as the ships of the other planets came into sight. Quickly they formed a giant cone about their leader's ship, a protecting, and yet a powerfully offensive formation.

Day after day they sped on through the darkness of the void. Then, as the yellow star flamed brighter and brighter before them, they slowed their ships till the small ships could safely be released into space.

Like a swarm of gnats flying about giant eagles of space the little ships circled the mighty masses of the parent ships. So huge were they, that in the combined masses of the thousand ships from each of the four planets, there rested sufficient gravitational attraction to force the little ships to take orbits about them. At a hundred thousand miles about them revolved a slow turning sphere of tiny ships, scarcely visible to the men aboard the giant liners, but slowly, steadily turning. The huge ships themselves had to

use some force to overcome the attraction of one ship on the other, and a slight push was used, which made it far easier to maintain their formation than would the circling of the ships.

IT was well beyond the orbit of Neptune that they met the first of the Solarian fleet. The tension that had been in both fleets throughout the preceding days was suddenly snapped, and like great machines set into sudden motion, or huge boulders, balanced, given the last push that sends them spinning with destructive violence down the slope, the two great fleets went into action.

It was only a little scout that they met at first, a little ten-man cruiser, but waiting only to receive a reply from headquarters after it had wirelessed the message of their attack, it was sent into action. Some of the generals wanted to wait and try to get the entire fleet up as a surprise attack, but it was decided that it was more important to know if the Invaders had any new weapons.

The Nigrians had no warning, for a ten-man cruiser was invisible to them, though the terrific bulk of their ships stood out plainly, lighted by a blazing sun. No need here to make the sun stand still while the battle was finished! There was no change out here in all time! The first intimation of attack that the Nigrians had was the sudden splitting and destruction of the leading ship. Then, before they could realize what was happening, thirty-five other destructive molecular motion beams were tearing through space to meet them! The little ten-man cruiser and its flight of one-man ships was in action! Twenty-one great ships crumpled and burst noiselessly in the void, their gases belching out into space in a great shining halo of light as the sun's light struck it.

Unable to see their tiny enemies, who now were striking as swiftly, as desperately as possible, knowing that death was practically certain, hoping only to destroy a more than equal number of the giants, they played their beams of death about them, taking care to miss their own ships as much as possible—still——

Another ship silently crumpled and suddenly one ship right in the line of the flight was brought to a sudden halt as all its molecules were reversed. The ships behind it, unable to stop so suddenly, piled up on it in chaotic wreckage! A vast halo of shining gas spread out fifty thousand miles about, blinding further the other ships, for the radiance about them made it impossible to see their tiny enemies.

Now other of the Solarian ships were coming swiftly to the attack. Suddenly a combination of three of the ten-man cruisers stopped another of the great ships instantaneously. There was another soundless crash, and the giant mass of wreckage that heaped suddenly up glowed dully red from the energy of impact.

But now the little ships of the Invaders got into action. They had been delayed by the desperate attempts of the big ships to wipe out their enemies with the death rays, and they could not cover the great distances without some delay.

When a battle spreads itself out through a ten-thousand mile cube of space—through a thousand billion cubic miles of space—it is impossible to cover it instantaneously with any machine.

Already nearly a hundred and fifty of the giant liners of space had gone into making that colossal junk pile here in space. They must protect them! And it was that flight of small ships that did protect them. Many of the Solarians went down to death under their rays. The death rays were exceedingly effective, but the heat rays were not able to get quite as long a range, and they were easily detected by the invisibility locaters, which meant sure death, for a molecular motion ray would be reaching over there very quickly, once they had been located.

The main fleet of the Solar System was already on its way, and every moment was drawing nearer to this running battle, for the great ships of the Nigrians had, although they were entering the system cautiously, been going at a very high speed, as we measure interplanetary speeds. The entire battle had been a running encounter between the two forces. The Solarian force, invisible because af its small size, was certainly getting the best of the bargain so far, but now that the odds were changing, that the small ships had come into the encounter, engaging them at close range, they were not having so easy a time of it.

It would be many hours before the full strength of the Solarian fleet could be brought to bear on the enemy. They were not able to retire and await their arrival, for they *must* delay the Nigrian fleet. If even one of those great ships should safely reach the two planets behind them——!

But within a half hour of the original signal, the Rocket Squad had thrown itself into the battle with a fervor and abandon that has given that famous division a name that will last forever.

The small ships of the Nigrians were beginning to take a terrific toll in the thin ranks of the Solarians. The coming of the Rocket Squad had been welcomed indeed! They were able to maneuver as quickly as the enemy; the little ships, all one-man ships, were harder to spot than the Solarian ten and twenty-man ships. The Solarian one-man ships were even smaller than the Nigrian one-man ships, and some of these did a tremendous amount of damage. The heat ray was, even when working at full capacity, quite ineffective against the ten-man ships, when produced by the small mechanism of the Nigrian one-man ships, but the great rays from the monster interstellar liners were fatal. The little one-man ships could not heat a ten-man ship beyond the capacity of their molecular motion cooling plant. By absorbing the heat and turning it into motion, they literally made the enemy supply them with their power directly. They were already supplying all the power anyway, but now they even conserved this supply!

But the one-man Solarian ships had a truly deadly plan as far as the Nigrians were concerned. The plan was officially frowned upon, for it was out and out suicide. The small ships were directed at one of the monster machines, all the power units on full force, then the man jumped from his ship, clothed in an altitude suit. Death rays could not stop it, and with the momentum gained, they could not make it less deadly with their heat rays, for, molten, it was still a deadly thing. A projectile weighing twenty-two tons, moving a hundred miles a second, is enough to destroy anything man can lift off a planet! Their very speed made it impossible to dodge them, and they usually found their mark. The fusion would destroy a molecular motion apparatus before it came within range, this was certain. And sometimes the pilot was picked up!

The Solarians began to wonder why it was the Nigrian fleet was decreasing so rapidly—certainly they had not caused all that damage! Then suddenly they found the answer—when one of their ships—then another—and another fell victim to a pale red ray that showed up like a ghostly pillar of luminosity coming from nowhere and going nowhere! The answer was easy—the ships were becoming invisible. The invisibility detectors were being overloaded now, and the hunt was hard, while the Nigrians were slipping past them, and at the same time many of them were silently destroying their ships! The molecular motion

rays were quite effective on an invisible ship—once it had been found. They were destroying the Nigrians quite as rapidly as they were being destroyed, but the great trouble was that the Nigrians were escaping them! The luminous paint bombs became effective now. All enemy ships were shot at with these missiles, and invisibility forestalled. In space, bullets go on forever.

BUT the scouts had done their duty now, for, as the watchers in the rear windows cheered, they saw the dark bulk of the main fleet coming near, a scarcely visible cloud of tiny, darting metal ships. The battle so far had been a preliminary engagement of the scouts! Now came the main engagement. The huge ships of the Nigrians were forced to stop their attack, and releasing the last of the small ships, retire to a distance, protected by the screen of small ships, for they were helpless against these swift-moving ones. The small ships had all been equipped with invisibility apparatus, but now that there were plenty of Solarian ships, they were more conspicuous when invisible than when visible, for the radio detector apparatus would pick them out at once, and all that was necessary was to send a beam of molecular motion controlling vibrations down the radio beam. The Nigrians soon learned that this policy was deadly and stopped using their invisibility. The Solarians also stopped shooting their luminous outlets, for any ship, so struck, was certain to be destroyed, and if the outlets didn't hit a foe they kept on going till they did hit something! The entire Nigrian fleet was beginning to feel desperate now, for they were cornered in the most undesirable position possible; they were outside the Solarian fleet, and their ships were lighted by the glare of the sun, while the Solarian ships were all in such a position that the enemy could see only the "night" side of them—the shadowed side—and, as there was no air here to diffuse the light, they were exceedingly hard to see. Into the bargain, the radium paint was making life a brief and flitting thing! The little ships would dart suddenly forward at three or four hundred miles a second, hoping to break through the Solarian fleet, but still the Solarian beams traveled at the ultimate speed, the speed of light, and the racing ships would suddenly crumple, and a halo of glowing gas would surround them as their atmosphere escaped. The Nigrians were paying a terrific toll in this first engagement! They could not spread their death rays to cover the entire Solarian fleet, for they lacked the necessary power, and their heat rays were likewise useless here. The great ships behind could not use their rays effectively, for their small ships must be between them and their adversary.

At last the Solarian generals tried a ruse, a ruse they hoped would work on these people, but they who had never before had to plan a war in space, were not sure that these people had not had experience in that art. The conditions of spatial warfare are far different from anything else imaginable. Here there is constant night and yet constant day. The position makes all the difference in the world. Or should one say in the universe? With the sun at their backs, the Solarians had a tremendous advantage. There were a thousand new things to consider, and not the least of these was the fact that there was perfect mobility in three dimensions. Never before had these conditions alone prevailed. Even an airplane is limited to about twenty miles range in the vertical plane, but here there were no limits whatsoever. All formations must be both defensive and offensive in all three dimensions. It required quick and accurate thinking! It was indeed fortunate for them that their enemy was even less skilled than they.

But the Solarians had the advantage of thousands of years of planetary warfare to rely on. This stood them in good stead now and a new ruse was on trial.

The Nigrians were rallying rapidly now. To their surprise, the forces of the Solarians were dwindling rapidly, and no matter how desperately this remnant fought, they could not hold back the entire force of the Nigrian small ships altogether. At last it was obvious that the small ships could completely engage the Solarian ships!

Quickly the giant ships behind formed a great dense cone of attack, and, at a given signal, the small ships cleared a hole for them through the great disc-shaped shield of the Solarian forces. And with all their rays playing straight ahead, the giant machines plunged through the disc of ships at close to 400 miles a second. They had broken through the Solarian defense, and were on their way to the unprotected planets!

The Solarian ships had at once closed the gap behind them, and nearly twenty of the giant ships had crumpled into wreckage as a Solarian beam found it, but for the most part the remnant of the Solarian forces were far too busy with the small ships to attack the large ones! Now, as the monster engines of destruction raced on toward the planets still close to two billion miles away, they knew that, far behind them, their small ships were engaging the Solarians. Nearly all of their small ships were back there now, but all of the Solarians were held in check! They were free to attack!

Then, from nowhere, came the terrific attack. Nearly five thousand twenty-man ships of Earth and Venus, invisible in the dark of space, suddenly leaped into life as the giant ships passed by! Their crushing destroying rays playing over the nigh-helpless bulks, the huge ships were crumbling into colossal junk heaps here in space; now, the last of their small guard of small ships stripped from them, they fell easy prey to the mass of darting ships. Faster than they could keep count, their mighty warships of space were crumbling under this sudden attack! The ruse had worked perfectly! Nearly all the ten and one-man ships had been left back there in the orinigal disc, while all the twenty-man ships and a few hundred each of the ten and one-man ships dropped back to form a great ring twenty thousand miles further back. The Nigrian small ships had been stripped from their giant parents by the disc, and as the great ships plowed their way through, unprotected now, they had fallen easy victims to the ring formation behind!

There was but one thing to do now. They were defeated. They must return to their far off black star and leave these people in possession of their worlds. Their great force was nearly wiped out, only the small ships remained, and these could not be completely carried in their great ships. There were too few now. They fell back swiftly, passing again through the disc, losing thirty more ships here, as the small ships formed a sphere of darting metal about them, then raced swiftly away from this great fleet of enemies. The Solarians, however, did not seem content. Their ships were forming in a giant hollow cylinder and, as the sphere of the Nigrians retreated, their rays playing behind them, the cylinder moved forward till it surrounded them, and they were racing together toward that far distant sun. The Solar end of the cylinder was closed now, closed by a group of huge ships that rivaled their own mile and a half long warships in size. The Nigrians had stopped using their rays now, and the Solarians followed them in armed neutrality, not molesting so long as they were not molested. The trip was slowed, for not all the little ships could be carried, and all must go at the pace of the slowest.

Many days this strange flight lasted, till at last the great yellow star, our sun, had faded in the distance and was only a tiny glowing pinpoint in the far, far distance. Then, suddenly visible out of the darkness, a strange, dark world loomed ahead, and their captive ships settled swiftly toward it. Through the air-locks the great ships settled into their world. No action was taken so long as the Solarian ships were not menaced, but for eight long months these darting shapes hung above the four circling worlds of Nigra, the Black Star.

Then at last the astronomers of Earth and Venus sent through the billions of miles of ether their message of safety. The guard could leave, and the sun they guarded would soon be too far from Earth and Venus to make any attack possible. The suns had passed, never again to meet!

Neptune's orbit they had passed many many billions of miles away, for now the young planet circled a sun so old it was dark—black! It had been captured by Nigra!

IT was a different system the men of the Solar System returned to. There were now nine planets, two new ones that Sun had captured from Nigra, in return for Neptune, and all the planets had shifted a bit in their orbits. Most of the major planets had been on the far side of the sun, far too distant to be affected by the gravity of Nigra to any permanent extent. Only Neptune, Earth and Venus had been on the near side. Had they been directly in line with the wandering star they would have been pulled out from the sun by the attraction, but, like a stretched spring, the gravitation of the great mass of matter that is our sun would have pulled them right back into their old orbits when the strange force had passed on. In order to change the orbits of the planets they must either be speeded up in their path or slowed down, or the mass of the sun must be decreased. Changing the mass of the earth would not affect its orbit to any practical degree, the mass of the earth being too slight in comparison to that of the sun to greatly alter the gravitational pull-centrifugal force ratio. However, increasing the speed in its orbit will increase the centrifugal force, without increasing the gravitational pull, and consequently the earth will fall away from the sun. If the speed be decreased, the force that keeps us from the sun is decreased and we draw nearer.

When the Black Star passed the Sun, Earth had been rounding the sun in its orbit in such a curve that it was going almost directly away from the Black Star. The gravitational pull of the distant Star had slowed its orbital motion considerably, and as the giant brake of gravitation fell on it, the speed dropped, and Earth promptly drew nearer the sun, thus acquiring more energy, for it was a pure mechanical fall. This process had repeated itself as long as the star had been near, the ultimate result being that, when the Star had passed, Earth was eleven and a quarter million miles *nearer* the Sun, though the Black Star had tried to pull it away!

The exact reverse had been true of Venus. Though on the same side of the Sun as the Black Sun, it had just been entering that position, and so was moving directly toward the Black Star. Here were the conditions that permitted the planet to fall toward Nigra, gaining speed as it did so. It therefore took an orbit which had a higher potential, further from the Sun. It moved nearly eight millions of miles from the Sun.

What the effect will be on the planets, we cannot say yet. The effect is certainly not very great, though somewhat greater warmth is felt on Earth, and a bit less on Venus. However, the elliptic of Earth's orbit gave us the effect of several millions of miles approach and retardation from the sun each year, and the result was not tremendous. The effects will, however, be exceedingly interesting.

And the Solar System has just passed through an experience which was probably unique in all the history of the mighty Nebula of which our Sun is an infinitesimal part. The chances that one star, surrounded by a system of planets, should pass within a hundred billion miles of another star, similarly accompanied, was one in billions of billions. That both systems should have been inhabited by intelligent races——

It is easy to understand why the scientists could not believe Arcot's theory of attack from another sun until they had actually seen those other worlds!

In that war of two solar systems we learned much and lost much, too, perhaps. Yet, in all, perhaps we gained, for those two planets will mean tremendous things to us. Already the scientists are at work on the vast museums and ancient laboratories that there were on them and every day new things are being discovered. We lost many men, but we have saved our worlds, and we have learned the secret of the energy of matter from them, the secret of that new light metal, and we have but scratched the surface of a science that is at least a thousand million years old!

* * *

TAJ LAMOR looked out across the void of space toward a distant point of yellow light. Far in the distance it glowed, and every second saw it a hundred miles further from him. They had lost their struggle for life and a new sun, he had thought, when he turned back, defeated, from that distant sun, but time had brought new hope.

They had lost many men in that struggle, and their dwindling resources had been strained to the limit, but now there was hope, for a new spirit had been born in their race. They had fought, and lost, but they had gained a spirit of adventure that had been dormant for millions of years!

Below him, in the great dim mass that was their city, he knew that many laboratories were now in full swing of active work. Things were being discovered, and rediscovered. New uses were being found for old things, and their daily life was changing. It was again a new race, rejuvenated by a change!

As the great sea of yellow fire that was that strange sun had faded to a point behind their fleeing ships, Taj Lamor had felt that his race was doomed to die, as their dead planets circled a dead sun, their last chance was forever lost. But now he had hope, for new ideas had come to them, and new methods of doing things.

Taj Lamor shifted his gaze to a blazing point of light, where a titanic sea of flame was burning with a brilliance and power that, despite the greater distance, made the remote yellow sun seem pale and dim. The blue-white glow told of a monster star, and a star that was far brighter than the sun they had left. It was the brightest star in their heavens, and it is the brightest in ours. We call it Sirius, but on their ancient star charts it was listed as a red giant, named Tongsil-239-e, which meant it was of the fifth magnitude and very distant. But in the long ages that had passed since that classification was made it had become a mighty sun; it was a star in its prime.

How were they to reach it! It was eight and a half light years away!

Their search for the force that would swing a world in its orbit had at last been successful. It was too late now to aid them in their fight for the yellow sun, but they might yet use it—they might tear their planets from their orbits, and drive them as free bodies across

(*Continued on page* 574)

By David H. Keller, M.D.
Author of "The Flying Threat," "Revolt of the Pedestrians," etc.

Boomeranging 'Round *the Moon*

PROBABLY one of the most mystifying of the world's motion problems, a competitor to the puzzle of the gyroscope, is the boomerang. This seemingly uninteresting crooked piece of wood is thrown forward as if to strike the earth fifty feet in advance of the thrower. It turns flatwise, rises possibly a hundred feet in the air, curves around and returns to fall perhaps at its starting point. Its possibilities might be made unlimited. Dr. Keller suggests a way, and, in his usual manner, brings his story to a surprise conclusion.

Illustrated by MOREY

"AVIATION is at a standstill," complained the president of Aviation Consolidated. "The inventiveness of man went only so far in the conquest of the air, and then came to an abrupt pause. Meantime, there seems to be a deadly satisfaction, as far as the great masses of humanity are concerned, and business suffers accordingly."

"But we are doing business," said the secretary.

"Certainly, but it is pretty dull business. I can remember when we first started the combined rail and air service from New York to San Francisco. The fare was over two hundred and we had space reserved for a year in advance. The same thing happened when the transoceanic service was started. People became air-minded. Everyone who took one of those long air trips wanted a plane of his own. Everyone wanted to be his own pilot; consequently, we sold planes by the thousands and by the millions. Now it almost seems that the point of saturation has been reached."

"Why not lower the price?"

"That will not sell any more planes. Everybody that wants one is easily able to buy one. What we must do is to find some new mode of flying, some novel method of travel that will stir the flagging interest of the average man and make him enthusiastic enough to sacrifice everything in order to have one of the new planes. You remember the radio? Nobody wanted a radio when television became perfected enough to be put into the average home. We want to do something like that with the air service. Only by doing that can we revive the early rush of business and make a profit that will please our stockholders.

"We have a large number of inventors working for us."

"Yes, but they are all on the wrong track. They want to make flying safer, easier. What we need is something that will make it harder. One of the things that has taken the pep out of the sport of eagles has been the efforts we have made to make it safe—and easy—and foolproof. Take the brakes off. Tear out the gyroscopes. Pass a law making it a felony to fly with a parachute, and you will see the way the people will fight to buy our latest model."

"You are the president of the company," finally answered the secretary. "You have a right to dictate the policies of the concern but I am going to disagree with you. Men want to be safe in the air. It is the feeling of safety that has made the great development in air traffic a possibility. We cannot go back to the old days of uncertainty and daily deaths. I agree that flying has become less spectacular, but it has become more attractive because it has become safer. You can talk all you want to, but you like to be safe in the air. You, yourself, would openly blame anyone for flying without the proper precautions."

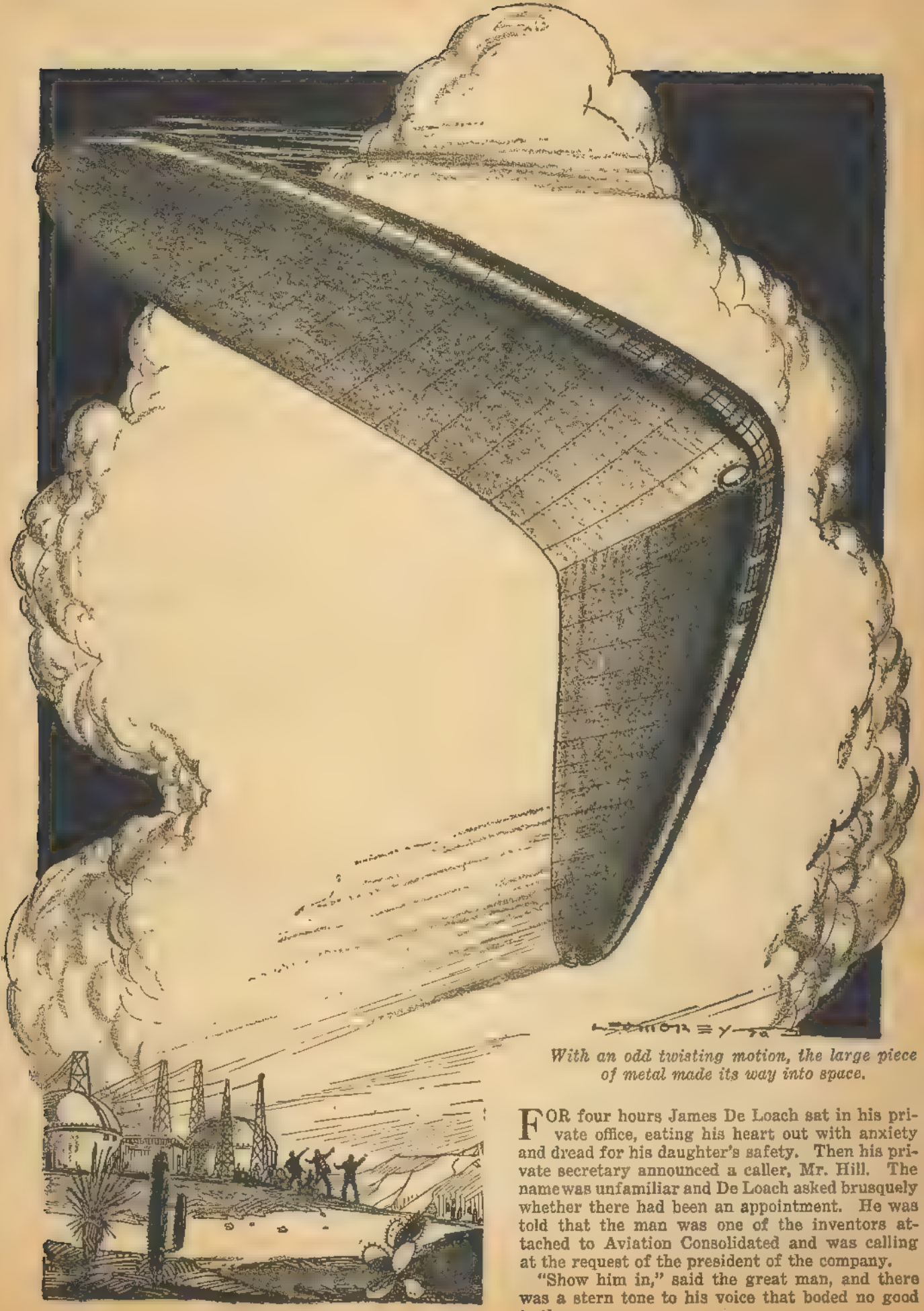
"I bet you a hundred that I would not," said the president.

"I will cover that bet. Your daughter is up in the air now with a young man. They are in an old plane without gyroscope or parachute. They have none of the modern appliances; not even a radio. I begged her not to go in that old model out of the museum; I wanted her to take one of the new planes out of stock; but she said that she and the young man *wanted to get a thrill out of flying like the young folks used to.* Now what is your reaction to that?"

"Who was the young fool that made her do such an asinine thing? Do I know him? How long have they been gone? The hundred? Well, it's my own daughter, man, and that makes a difference. She is in danger. Take your cursed hundred. I would give her a million for the right to spank her this minute. Did you say you knew the man?"

"Certainly. He is one of our inventors."

"Tell him to see me as soon as he gets back."



With an odd twisting motion, the large piece of metal made its way into space.

FOR four hours James De Loach sat in his private office, eating his heart out with anxiety and dread for his daughter's safety. Then his private secretary announced a caller, Mr. Hill. The name was unfamiliar and De Loach asked brusquely whether there had been an appointment. He was told that the man was one of the inventors attached to Aviation Consolidated and was calling at the request of the president of the company.

"Show him in," said the great man, and there was a stern tone to his voice that boded no good to the young man.

"Sit down," he commanded, "and answer my questions. How long have you been going with my daughter? Who said you could do it? What did you go planing with her for? Why use a foolish old plane? Did you realize that you both might have been killed? How do you think it would look to have my daughter die in a plane twenty years old? Answer me! Keep your mouth shut! You are fired. Dammit!! What have you to say for yourself?"

"No man talks that way to me, Sir. I am leaving."

"No, you are going to stay. What made you do it? I was wild with anxiety. She is my only daughter. Mad as a March hare, but, dammit! I love her. Tell me the story."

"Not much of a story, Mr. De Loach," was the answer. "I met Dorothy at a dance. We had mutual interests. She learned that I had some ideas in regard to the air and the future of flying, and she was interested. We wanted to be alone and talk over matters, so she went out riding with me. We took an old plane, because that is the only kind I can afford to own. That is all."

"But she has a dozen new models of her own."

"Yes, Sir, but she wanted to go with me."

"So, you have ideas about the future of flying?"

"Yes, but at present they are visionary. They are discouraged by the Head of the Department."

"Why?"

"He says they will not do because they are not safe."

President De Loach called in his private secretary and gave him a rapid order:

"Send in two club sandwiches, and a large pot of coffee. Leave word that I have gone home for the rest of the day. You can have the day off. Now then, Mr. Hill, start in and tell me about these dangerous ideas of yours, that will make flying difficult and even a deadly sport."

"It is interplanetary stuff, Mr. De Loach."

"All right. I don't care what it is, so long as I can get a kick out of it. If it thrills me, it will satisfy the people, and if they are satisfied, they will buy the machines. Go on!"

"It is this way. People have gone everywhere they wanted on this earth. They have gone over the poles and around the equator. It is a common thing to go across the Atlantic. When travel becomes commonplace, it loses its interest. It is just as easy to go across the United States in the air as it used to be to go from New York to Boston on a train, or from New York to Buffalo in an automobile. I figure that folks are tired of traveling around on the earth. They have been everywhere and there are no new sights for them to see; nothing novel for them to experience. They are just bored with air travel as it is today. They are not buying planes, because there is no thrill. A friend of mine told me that he had more real pleasure in *walking to Philadelphia* than he had in flying around the world, because he found that he really had something to brag about and the newspapers said it was real news. So I have been working on interplanetary flying—and it is not really flying, either."

"I like your line of talk," sighed De Loach, "but this interplanetary stuff so far has just ended in talk. Not a single really sensible invention has been proposed to make it possible."

"That is because they cannot think in new terms. When they start on interplanetary inventions, they simply reduplicate their old ideas about flying in the earth's atmosphere. Now, my idea is that the trick will never be done with a hollow steel sphere or a cigar-shaped carrier,—a heavier-than-air ship, or any of the proposed forms of interspace flying machine. In the first place, all these inventors feel that they have to either go in a straight line or in a circle, but always under the complete control of the pilot. For example, they visualize a ship starting out for the moon. Halfway there the pilot changes his mind and determines to go to Venus. He simply changes his direction the minute he changes his mind."

"Well, what is the harm in that?"

"No harm, only it cannot be done. It never will be done that way."

"Then you know *how it will be done?*" and there was a degree of sarcasm in the president's voice?

"No. I am not sure that I do, but I have my ideas. Years ago when men were learning to fly, what did they do? They studied the birds. The Wright brothers spent a long time in trying to see how the birds did it. All of our efforts were directed toward duplicating their cleverness in the air. Now, why not do the same thing in thinking of interplanetary flying? No birds there. No use of going to the moon as a bird would, because a bird does not go there. Then what? Why not study the things that are flying in those billions of miles of space? What are they? Planets and comets and satellites and asteroids. That is what we have to do. See what makes them move; then go through space as they do."

"You have one idea there, my boy. Just one idea. You add a few more to it, and you will amount to something."

"I have some more to add to that first one. These things that move in the sky move in three ways, don't they?"

"Something like that."

"Take the earth. It revolves on its axis; second, it revolves around the sun; third, there is a suspicion that the sun and the earth and all the sun's planets are moving on through space. That is one idea; another is that while all the moving bodies finally come back to their starting point, none of the orbits are perfect circles. It takes some of the comets many years to complete their orbit. The astronomers say that these orbits are egg-shaped, or something like that; at least they are not round. That is another idea. Now, here is one more. The physicists state that a body, once started in a certain course, is apt to continue in that course, and, to be sure, all the bodies are mutually inter-affected by gravitation."

"That is all interesting, but it does not tell me how you are going to go ahead," ventured the president.

"My thought is to make a piece of metal and shoot it into space. Plan beforehand just what its orbit will be. It goes into space, spins around and comes back, so timed that it will fall into some soft spot on the earth—some place like the Sahara or the Atlantic Ocean. If we can do that and send that piece of metal around the moon, then we can go further and try other orbits."

The great man yawned.

"You are one 'heluva' inventor. You are a dreamer. You stay away from my daughter. I want real men to be interested in her. You know as well as I do that your plan is absolutely impracticable. You say this piece of metal is to be fired into space? Suppose it is? It is going to keep on going, isn't it? The Germans had a big Bertha during the late war that threw a shell seventy-five miles. The shell kept on going till it dropped, didn't it? It didn't turn around and come back again. You shoot a revolver, or a rifle, or throw a stone, and it keeps on and doesn't return. So would this piece of metal. We could easily shoot a piece like that outside of the earth's atmosphere, but it would just keep on till it was captured by some planet. You go back and bake your brains some more, and in the meantime, stay away from my daughter."

"But there is one thing that you could throw or shoot that would come back."

"What is it?"

"A boomerang," said the inventor.

"And now I know your brains are soft."

"They may be, but there is an idea there. A boomerang comes back to the person who throws it. It may strike the object aimed at and return to the sender."

"A boomerang? Just what is a boomerang, anyway?"

"It was a weapon invented by the savages of Australia. Since I became interested in it, I looked up the history of it as a weapon. It seems that the armies of ancient Egypt were armed with it. They are made in the shape of a sickle, curved at an angle of ninety degrees more or less. The thickness is one-sixth of the breadth, and the breadth is one-twelfth of the length. The length varies from six inches to three feet. The wood is rounded on one surface and flat on the other. It is held vertically, the concave side forward, and thrown in a line parallel to the surface of the ground. When thrown, it is rotated with as much force as possible. It travels straight for thirty yards or more and then turns over on its flat side and rises in the air to the left. It now follows a sort of a circle, with a diameter of about fifty yards, and returns to the exact spot from which it was thrown.

"I found in studying the subject that exhibitions of throwing these objects were often a feature of vaudeville performances some years ago, but there has been no vaudeville for many years; not since television became so popular. Yet I believe that we could find someone who knows how to throw a boomerang, and then it would be easy to invent a machine that would duplicate the effort of the human hand. We can measure the exact force necessary to throw one of a certain weight a certain distance, and then a very simple arithmetical problem will give us the force required to send one around the moon."

The young man paused. The older man became irritated, but said:

"Go on talking. It's all nonsense, but keep on."

"Then, we can build a boomerang out of aluminum. In its hollow cavity will be a number of rooms for storage of provisions, oxygen, bedrooms, and everything that would be necessary to make life comfortable. Thick windows of glass would afford opportunity to see the celestial scenery. In fact, the equipment would be in every way similar to the modern airship, with the exception of additional precautions necessary for the cold and the absence of atmosphere.

"I believe that the initial force would have to be supplied by a form of projectile power outside the ship, but in addition, I feel that we could add a tube at one end of the ship through which we could use a propulsive power of the recently discovered atomic energy. The power obtained from a minute amount of this new source of energy is so great that there would be no trouble in storing sufficient energy to make many thousands of miles more than would be necessary to go around the moon.

"You see, the important thing is the spin of the boomerang. So long as it spins, it goes forward. We shall have to determine the power necessary so that it will travel forward the required number of times before it begins its upward curve to the left. We shall also have to figure the pull of the earth and of the moon. The power that it is sent forward with has to be sufficient to overcome the gravitation of both spheres. That is simply a question in mathematics.

"But in its flight this boomerang will closely imitate the course of a planet. It will revolve on its axis and will also revolve on a definite orbit. In the course of time it will return to the starting point. I believe that the best way to start the experiment is to——" But he was interrupted by De Loach, who said calmly:

"The best way to begin is to make a small one that we can experiment with. After that the only problem that we shall have is to enlarge everything. I think that the thing to do is to begin at once. I will put the entire constructive proposition up to our chief engineer. I want you to help us all you can. I think that this idea of yours is the biggest thing that has ever come into the brain of an aerial inventor. You can name your own salary from now on. Suppose I call up Smithson and get things started?"

SMITHSON, the Chief Engineer of the Aviation Consolidated, was at once sent for. He was just leaving the office to keep an appointment with Dorothy De Loach, for he also was in love with that young lady and felt that his very responsible position in the company gave him the right to expect far more than his minor rivals, like Hill. He was mad at having to break the engagement. He was more mad when he found that Hill was the direct cause of his having to do so. But he was too afraid of the energetic president of the company to express his thought. He listened carefully to the proposition, acknowledged that it was all new to him but that he would study over it and see what could be done. De Loach ordered him to construct a model boomerplane of about twelve feet in length.

At once the entire inventive force of the company was at work, determining the various details that would be needed in a boomerplane large enough to make the trip around the moon and back to the earth. Supplies, oxygen, motive power, scientific instruments, in fact, every possible detail, were thoroughly considered. Men worked day and night, but at the same time, the greatest secrecy was kept. And while every man knew some part of the plans, no one except Smithson had the complete set of blueprints and specifications.

It did not take long to make the twelve-foot model. When it was tried out on the secret testing grounds, it made a beautiful flight of one mile. This flight was an exact duplication of the flight of a boomerang thrown by hand. Pleased with this first performance, De Loach ordered one made twenty-four feet long. This one made as satisfactory trial flights. It was now felt that with the aid of the mathematicians and astronomers a boomerplane could be constructed large enough to make the circuit of the moon. A power plant was erected in an Arizona desert and the work of constructing the final machine was begun. Arrangements were made for an initial explosion of atomic energy in back of the plane that would throw it the first two hundred miles. After that it would be carried onward by its own power.

During this period of construction the main actors concerned reacted in different ways to the excitement. De Loach was restless! Thrilled as he was with the thought that his power and wealth might be the means of introducing an entirely new factor into the problem of interplanetary travel, he could not bear to face the thought of failure; yet, that thought was constantly with him. Hill, the man that was responsible for the whole affair, had left all the engineering details to Smithson and had occupied himself entirely with the furnishing of the many rooms inside the body of the boomerplane. Smithson, who alone was responsible for the proper transforming of the blueprint details into aluminum, passed long hours and days without sleep. Dorothy De Loach also had many bad nights, and she had sufficient cause for these.

For Hill, the young inventor, had told her and her father that he had determined to make the first trip around the moon in the new machine. He felt that it would be useless to send an empty machine around on this spectacular trip. Some scientist should be in the

machine to make observations and tell the whole story on the return to the earth. He did not feel that it would be right to ask anyone else to assume this danger; so he decided to go himself. De Loach hated to see him go, yet he felt that he could not order him to stay. Dorothy cried and cried and that was all the good that it did. Smithson developed more insomnia, but kept on working. He openly praised Hill for his determination to take the dangerous trip. In fact, he had known that the youngster had determined to make the first flight many weeks before—he had known it before the final model was begun.

Finally, the completed boomerplane lay on the scaffolding in the Arizona desert. It was completely stocked. Hill had really overdone the matter of supplies. Store room after store room was filled with the necessities of life, sufficient to last several years. He explained to Dorothy that these would be necessary if their calculations went wrong and the boomerplane remained out in space instead of returning to the Arizona desert. This simply made Dorothy feel worse than before.

THE programme called for the final departure of the enormous mass of metal at six A.M. on the first of June. A few dozen scientists had been invited to be present. On the evening of the thirty-first of May, Hill called on Dorothy De Loach. The call was short and anything but sweet. She asked him to abandon his plan of making the first trip in the boomerplane.

"It is all nonsense," she explained, "for either it will come back to the starting point or it will not. If it does, why then we know it will be safe to make a second trip; and if it doesn't come back, we know that it would have been death to make the first trip. So you stay right here."

Hill refused. He explained as best he could that he loved her but that it was a question of professional pride to have confidence enough in his own invention to trust his life to it. The young lady heard him in silence to the end, and then simply said that she was through with him and the quicker he left, the more time she would have with a sensible man, who, of course, was none other than the Chief Engineer.

That started a real quarrel but a very short one. The girl handed Bill his hat and refused absolutely even to get up in time to see him start on his interplanetary journey. She was not very nice to Smithson the rest of the evening, but at least she allowed him to stay with her. The next morning she kept her promise and was conspicuously absent when the time came for the plane to leave the earth.

De Loach made a short speech to the newspaper reporters and handed them a complete description of the boomerplane and the idea back of it. Then Hill said good-bye to everyone and entered the cabin door, which he at once closed from the inside, and sealed. To Smithson was given the honor of pressing the button that started the novel aircraft on its course. With a peculiar whirring noise, the large piece of metal rose into the sky, and, with an odd twisting motion, made its way into space. Smithson wiped the sweat off his face and asked De Loach to excuse him for the rest of the day. The president of Aviation Consolidated went back to the ranch-house which he had leased for a temporary home during the work in Arizona. Once there, he sent for his daughter. She could not be found. But in her room was a letter addressed to him. He read it as quickly as he could,

"My dear Father:

"At the last moment I found that life without Henry Hill was an utter impossibility. He insisted on making this first trip and I felt that it was so very dangerous that I could not let him go alone. So, I am going to hide in the boomerplane and not let Henry see me till it is too late to return. I hope, for your sake, that we get back all right. See Smithson at once. He knows something about the boomerplane that he has hinted at to me. I love you.

"Your daughter, Dorothy."

"Now, isn't that just like a woman?" said De Loach, swearing. "I thought Smithson looked peculiar this morning. Well, we will see what he has to say for himself."

When the Chief Engineer entered the President's office an hour later he was handed the letter without a word of explanation. The official read it and then started to walk rapidly up and down the room.

"This is a horrible complication, Mr. De Loach. Whatever put such a thought into your daughter's head. She is as good as dead. She will never come back—never! Never!! And I am her murderer!!!"

"Nonsense," said De Loach kindly. "No one will blame you for her conduct. I know that you were so jealous of Hill that the last thing you would have done would be to help her with such an escapade."

"But you do not understand."

"Well, tell me about it."

The tortured man finally sat down and began his explanation.

"You know that the final preparation of the plans and blueprints was entrusted to my care. No one knew all the details except myself. Hill had an idea, but when it came to making that idea a mechanical possibility, he left everything to me. I did not love him very much, Mr. De Loach. Why should I? I could have won Dorothy had it not been for him. I really hated him, and when I saw that his idea was mechanically possible and that he was bound to become famous, I determined to do everything that I could to destroy him. I had to do a lot of study in regard to the boomerang, and I suddenly found out something that everybody else had failed to take into consideration at all. There were *two kinds of boomerangs. One came back and the other did not.* One was called the return and the other the non-return, or war boomerang. The war variety looked exactly like the return kind, except *the relation of the surfaces was different.* No one knew very much about this *law* except myself. So, when I drew the plans, I made them for a non-return type instead of a return. That means that the boomerplane is just going to keep on going. The more power Hill uses, the further it will go. He cannot turn it around or influence its flight in any way. I wanted him completely discredited, but I wanted something more. I wanted him to disappear and stay disappeared. I was sure that if he never came back, I could some day persuade Dorothy to be my wife. Now he is hopelessly lost, and she is with him—and there is nothing that we can do."

The president of Aviation Consolidated looked at the engineer in horror.

"You ought to be killed!" he whispered.

"I agree with you and I will attend to that detail at once."

A little later he shot himself.

HILL had gone into the boomerplane and closed the door. He looked at his watch, saw that it was six A.M., and made himself comfortable in one of the observation chairs. Soon he saw the earth beneath him growing more and more indistinct. He was on his way.

Now that it was all over, and the machine was finally made, and the work all done, the real experiment began; he had a peculiar sense of ease. He took out of his pocket a letter from Smithson. The engineer had handed

(*Continued on page* 574)

The Triple Ray

By R. V. Happel

THE Consolidated Press recently issued a small obituary paragraph which no doubt carried little significance to the majority of newspaper readers who chanced to see and read it. The wording as I remember was to the effect that "Professor Lucius Raymond, who at one time gave promise of being our greatest atomic scientist, passed away at his home in Maine. After one brilliant coup, Prof. Raymond apparently abandoned all research work and became a recluse."

It was actually worded in a nice way in order not to give the impression that Lucius Raymond was an eventual failure, but such was the idea in the back of the writer's mind, as the delicate wording proves. It had, indeed, been taken for granted that Prof. Raymond had expended all his scientific reserves in his "one brilliant coup" and was a burnt-out man thereafter.

This is not so. To dispell that illusion I am attempting to set forth here the real magnitude of Lucius Raymond's life work, which was never known nor dreamt of by the reading or scientific public.

Lucius Raymond and I were the closest of friends from college days until the very night of his death. I was with him when he discovered the Twin Ray, and I worked with him for months and years until by great luck and fortunate (or unfortunate!) accident he discovered the terrific Triple Ray.

Everyone has heard rumors about the Twin Ray, which those who know commonly call "our priceless war instrument." Few, however, are aware that this alone caused that vastly unexplainable retreat of the German Army at the time it had Paris and victory within its reach. The Twin Ray alone ended the conflict. An extremely solemn conference, made up of a diplomat representing each combatant land, was held in a neutral European country. Before these men Prof. Raymond demonstrated his Twin Ray.

But this is in no sense of the word a "War" story. I merely use an illustration to show the effectiveness of the Twin Ray. This conference had been called because, to quote the leader of our forces, "so devastating a force could not be loosed even upon an enemy until all means had been taken to secure his willing retreat and disbandment."

The conference had been called, of course, with the object of impressing the Teuton diplomat. I can easily remember the stout, florid man who distinctly reminded me of a delicatessen dealer I have traded with for years. He was gruff, loud-voiced, and though an enemy, most engagingly genial. One long window of the council chamber was open on the grounds. Outside on the lawn was a row of effigy infantrymen.

After a few polite words of no particular importance, Prof. Raymond turned his ray upon these effigies, and in one swift instant, sweeping from left to right, annihilated every one with an efficiency both noiseless and complete.

The German diplomat slowly popped his eyes out (I was sitting across the room from him) and then said loudly "Gott in Himmel!"

A number of similar experiments were staged with metal as well as whole sides of beef, the beef being used to show the ray's effect on flesh. One and all the subjects vanished into a faint, disappearing cloud of dust. The German and Austrian delegates finally left together in a great hurry, and the next morning the retreat commenced.

And what was this thing that turned solids to gray dust? In pure fact it was absurdly simple, to a certain point. It was, in fact, nothing more than the combination, in a single beam, of ultra-violet and infra-red rays. One acted merely as the carrier of the other, the violet ray insinuating itself within the atomic structure of the object to be destroyed, while the infra-red was carried "on its back."

A strange property of the infra-red was then displayed. When injected so into the atomic being of an object it at once nullified all cohesive power of the atom nucleus and at the same time slowed down the speed of the electrons which fill or rather lie within tiny orbits about the nucleus. Immediately the structure collapsed into inert atomic dust as minute as the motes in a sunbeam. The result, you see, was much the same as would follow if one were able to suddenly pull every nail out of a frame house.

But this result, while it may have constituted a "priceless war instrument," was not all that Prof. Raymond desired. He was eager to release, instead, the very real and immense store of power in the atom's structure. He finally did so, and I fear found it not a great deal unlike Pandora's box.

Perhaps, though, it would be best to explain this power of the atom before continuing further. First consider the atom itself, which constitutes the material of everything on earth. It consists of a center or nucleus about which revolve or are distributed a number of "satellites" like planets about a sun. The number will increase from but one in the case of the lightest of gases to ninety-two in the heaviest of metals. This atom, you have been told over and over, is so small that several million might be placed on the head of a pin, and several hundred thousand would be undisturbing in the corner of the eye. I do not know the exact figures, as I have small flair for futile mathematics. However, these orbital particles, small as they are, would, if they should suddenly decide to travel in a straight line, cover a distance of thirteen miles in one second.

If the power in the nucleus which holds them to their places should be reversed and drive them apart with this terrific impulse added to their own speed, their explosive force would be all but unbelievable. There can be little doubt that, if all the atoms in the bowl of the teaspoon with which one stirs his morning cup of coffee, should suddenly straighten out, he and his neighbors and that whole end of town would vanish in a glorious sheet of flame. That, indeed, is the power of the atom.

THE Twin Ray which "pulled the nails" out of the atom was generated in a regulation medical X-Ray tube. The X-Ray itself is of ultra-violet character. In slowing a portion of them up by passing them through a heavily leaded quartz prism, (*Continued on page* 570)

Terrors of Arelli

IN "The Princess of Arelli" our well-known author was much concerned with the televisophonic communication with the inhabitants (as he found them) on the moon, and his hero's trial flight across the void. In this sequel, however, interstellar travel being an established fact, the story is concentrated in its entirety on our satellite, the moon. It is quite logical to assume that since this is the closest body beyond the earth's atmosphere, man will naturally try to solve its mysteries during the first experimental stages of interstellar travel, if and when that time comes. Until such time, it will be impossible to say what might be found upon—or perhaps below—the cold surface of the moon. As a writer of thrilling scientific fiction, this author needs no further comment. We can, without any hesitation say, "Terrors of Arelli" is even better than its predecessor.

Illustrated by WESSO

NO INHABITANT of the planet Earth is likely to have forgotten the major incidents of the first successful voyage to the Moon, known to her own people by the name of Arelli, as our planet is called by them Marelli. This was in the late summer of the Earth year 1938, corresponding to the Arellian tello, or year, 817 of the 211th iltello (an iltello being a thousand years), and followed by a few months the establishment of radio and televisual communication between the two planets. The names of all who were in the least connected with the significant event have become household words on both worlds. In chief comes Frederick X. Harding, the astronomer and selenographer who spoke the first word that carried across the void of a quarter of a million miles; whose eyes were turned the first into those of our fascinating celestial neighbor; whose wealth and industry built the space ship *Terraluna* and whose presence on her maiden voyage contributed so largely to her success; who wooed Altara, the beautiful and beloved Princess, and wedded her according to the Arellian form, with his feet on the mountains of Arequipa, Peru, and hers in her father's kingdom. Then comes that jovial and courageous young Irishman, Larry Donelan, master aircraft builder, who made the ship, navigated her safely across the uncharted and pathless voids to her destination, and received his reward in the hand and the love of the fair Sanna, intimate and friend of the Princess.

Nor will any fail to recall the so nearly disastrous adventure of the abduction of the Princess and Sanna from the very midst of the nuptial festivities through the jealous rage of the evil Ullo, aided by his friends, the barbarians who resided in the craters that lay deep in the nearly inaccessible fastnesses of the monster Doerfel Mountains, not far from the crater Tycho, in the south polar region of the Moon. Nor are the events ensuing far down in the tunnels and cavern settlements beneath the airless and waterless surface of Arelli to be forgotten, where the people had dwelt since being driven from the surface by the adverse conditions so many thousands of years before that all count of them had been lost in the mists of antiquity.

In these thousands of centuries Arelli had grown old. The Hesperidian days of her youth were passed and gone; middle age had come and gone, too, and old age had overtaken her. The beauty of her virginity, which had been when the gods themselves were still young, had given place to a paler complexion and a dimmer eye, and her enticing skin had been marked by the cracks and pitmarks of old age. The pliant loveliness of her body that had so rejoiced the young gods was become stiff and ugly, and racked with the painful convulsions of senility.

The gardens and the green fields had withered and turned to barrenness. The zephyrs that had fanned them had been sucked back into the vacuum of surrounding space. Her seas had become lakes, then stagnant marshes, and then had disappeared below.

Her multitudes had gradually left the desolate stretches and gathered in the vast craters where there was still air and water, and as these refuges, too, had failed in their necessity, they began to hew out places in the rocks of Arelli far below the surface, following on the recessive steps of the elements. For thousands of centuries the Arellians had sunk their dwellings deeper and deeper into the rock until, in the 211th thousand of years they were hundreds of miles below the surface.

There they had found they could go no lower. Not that the heat or the damp was too great, or the rocks too hard, or the means lacking to hew them out. None of these things. It was that they had learned they were not the only inhabitants of Arelli. The workers had broken through one day into great open spaces in the interior. They were the workmen whose heroic statues stood in the amphitheater from which the terrestrials had been first conducted to the underground settlements.

No one ever knew just what took place down there the day the workmen broke through into the place of the beasts, but the story would not be hard to construct.

Sequel to "The Princess of Arelli"

By

Aladra Septama

Author of "The Beast-Men of Ceres," "Tani of Ekkis," etc.

¶ *Looking down, he soon understood the reason for the muffled scream.*

A group of seven workers had been hewing out places for the extension of the lower levels of the settlements. They used the Arellian boring machines, which could make many feet of finished tunnel in a day. From the lowest level they were making a tunnel downward another five miles to establish another level. For hours they had noted the hollow sound given forth, and they had wondered much, these heroes, what it might signify. No doubt it was nothing but the reaching into another of the frequent natural caverns, which lessened their labors.

"Matto," said a workman to his companion, looking around to see that no one was near, and speaking low, "I am sure I heard some strange sounds a while ago. Did you notice anything unusual?"

Matto shook his head. "I noticed nothing, Stello, except that there was a screeching of the machine. As soon as the erro is over we must give the word to the machine tenders to go over the machine and see what is the matter, or it may break down and delay our work."

"Perhaps you are right, Matto. It must be you are, for what would there be down here but the machine which could make such a screaming noise? And yet, Matto"—Stello looked over his shoulder furtively and saw that no other was near—"and yet, a machine has no mind or will that can take hold of the spirit of a man and lay such a burden of fear upon it as there was upon me when I heard the screaming. I am afraid, Matto, my old friend. Afraid. You, Matto, know that I am not a coward, but—now I am terribly afraid. I feel as if something strange and terrible were reaching out for me."

Matto put a hand on the shoulder of the younger Stello, and gave a short laugh that sounded hollow and insincere in the gloom. "Nay, there is naught to fear, Stello. What could there be? It is unpleasant down here where the lights are confined to our working lamps. It is hollow and damp, too. I don't like it any better than you. But there is nothing to fear. What could there be to harm us?"

A gong sounded then, which announced that the erro was over and it was time to leave their work. The humming of the boring machine ceased abruptly, and gathering up such things as they had with them, the two men turned back to join their fellows and go to their homes for the coming enna of rest.

"Say nothing of what I told you, Matto," cautioned Stello. "There is no need to frighten the others, just because I am afraid of the noise of a piece of machinery."

Matto nodded acquiescence, and they went home to their wives and children.

WHEN the enna was over and the next erro of labor had come, Stello had his "morning" meal, and prepared to return to his work below as soon as Matto, who lived near by, should come past and pick him up in his vehicle. A shout soon announcing Matto's arrival, Stello called his wife to him, told her he was going, patted her arm, and smiled at his children, and started out.

What strange thing is the human soul that it seems to reach forward at times to things unarrived and unknown? Do events of the lives of men wear a sinister or a happy *aura*, that reaches us before the facts themselves, impressing upon us in advance the character of the coming event?

One does not know. But then, why was it that on the very threshold of his dwelling, Stello turned back to touch his wife and children again, and say more words of love to them, before he went out to Matto's vehicle and returned to work far below? One does not know anything about it. The human spirit is taken by strange fancies at times.

Matto had come early, and the two were on the ground by the machine before the others.

"The machine is quiet enough now," laughed Matto. "Let us see if it will work as quietly as it rests." He turned the power that started the mass of metal, and watched it attentively a moment, cocking his head to listen for any sound of complaint from its parts. There was none. He and Stello looked it over and made sure it had been tended for the erro's run.

The two neighbors stood a moment in silence, then gave each other a shame-faced glance. They knew they had both been listening, listening, not to the machine's metal voice, but in spite of themselves listening toward the place ahead of the machine. There was a light sound behind them, and they both jumped nervously. But it was only their companions, who had come up so quietly that they had not heard them in their preoccupation.

They went at their work. As the machine bit into the rock ahead, took the mouthfuls into its insides, and spewed it out behind, reduced to one-tenth of its former bulk, it was piled along the edges of the excavation to be out of the way until the work cars should come along later and dispose of it.

The successive bites of the machine gave off a more and more hollow sound, as it edged its way along into the space of the rock it had eaten and cast off. But even the nervous Stello, unconsciously listening, listening, from time to time, could not find any complaint. Except for the slight sound of the machine and its hollow gnawing ahead, it was silent enough for the most sensitive of them. There was nothing to terrify a child.

About the middle of the erro the crash came. The thinning wall before them suddenly fell into the natural cavern ahead, and for a space a man could pass through erect, for the way was clear. A dim, ghostly glow came through to them, as they went to stand in the entrance the machine had made. By its light they could see the cavern reaching ahead for what seemed miles, but they could not see the ceiling. The floor of the place was rugged. Rocky ridges extended across before them, so they could neither see anything of what lay on the bottom beyond.

When their eyes had become a little used to the weird gloom they could see well enough. So they set down their hand lights in the opening and made their way slowly and cautiously. Matto went ahead, and in spite of himself he could not entirely forget Stello's mysterious panic. He proceeded cautiously. In a minute he called back to Stello to shut off the machine, saying they would not need it for a while, and Stello turned back to do so. When he got back to the entrance his fellows had disappeared beyond one of the transverse ridges. He could hear the sound of their voices and their footsteps, but the cavern gave it back to him so hollowly that he could not tell what way it came. He stood still a moment at the entrance, listening. Had they gone around the point at the right? In that case he must pass to the right of a huge pile that closed the way. Or had they gone behind the jutting cape of rock at the left? In that case he must pass to the left of the huge pile. Or, finally, had they climbed directly over the ridge straight ahead? That would mean taking still another direction to reach them.

As he puzzled over the matter, he heard Matto's voice again, and he thought there was a note of alarm in it, although it was calm enough. Then there was a blood-curdling scream from one of the others, accompanied by another sound he could not name, except that it was not human. Followed at once a bedlam

of rushing sounds—whether of wings or feet Stello could not say—mingled with animal snarls, and human cries of fright, pain and despair.

Then, booming through the mad mêlée of sounds, came to him, clear and calm, the voice of Matto.

"Stello! You must go back into the tunnel quick, and blow up the entrance. Do you hear?"

"Aye, Matto, old pal. What is the matter?"

"Quick, Stello! Quick! Blow it up and save"—Matto's voice jarred and broke, like the voice of a man who is trying to speak while struggling violently. It ceased a moment, then came again, muffled and hardly discernible. "Blow it! Blow it quick, Stello! Tell them to come down and make it secure. Quick! The place—is filled—with——"

There was a gasp and then no more, but Stello was already dashing to obey. He snatched his pocket radio. There was no need to wait for any "connection." His message would register automatically, and repeat his message to the operators who were always listening.

While speaking, he was making his way to the place where the bombs were stored that they had to use at times in their work. He seized one in his idle hand and started forward, still speaking his message. Then he turned back, and, his message given, dropped his radio and caught up two or three other bombs. One might not do the work well enough. The beasts must not be allowed to escape and destroy the people. He knew well enough what was the meaning of Matto's words "blow it up and save." In his last seconds Matto was thinking, not of saving himself, but of protecting the people.

In the frantic moments Stello, too, thought of his sweet wife and babes. Well, he, Stello, need not die. He was in the tunnel; the mouth of it was between him and—that which was in the great cavern ahead; he need only throw his bombs to seal the mouth, then hide himself quickly behind the machine until the débris was settled down again, and make his way home. His companions were doubtless all dead. He could not help them. Matto's voice had shown that he was already struggling and being overcome by the—by whatever had held him in its grasp.

But Matto he had played with in infancy, fought with in youth; Matto and he had shared everything—always; Matto the wise, had always counseled him; Matto the strong had always helped and stood by him.

A groan came up from the depths of Stello's soul. "Matto! Ah, Matto!"

IT was over. Quietly he made sure of his bombs, stepped through the opening into the cavern of terror, picked the right place for his throw, and flung one of his bombs into the mouth of the tunnel behind him.

"Matto! Ah, Matto!"

Calmly and steadily, he watched the mountains of falling rock and débris crash down between him and his world.

That is what might have happened; that is what probably did. At least Stello's message had said he was in the tunnel and his fellows were being attacked in the cavern. It was clear he was not then in urgent danger, and clear that he might have cast his bomb as well from one side as from the other side of the entrance.

Thus had passed the heroes whose statues stood above. And what complaint had they? They lived in stone, even if their stone arms and bodies could not feel the embraces of their wives and children. If they complained in the place they had gone, it was not known. Man dies, and if he has done some great thing, his statue may sometimes be set up in stone or bronze. The next generation or two boast of his exploit as if it had been their own; the next tells the thing a little vaguely; and the next says petulantly, "Who were these, and why do they stand in stone here in the way?" Then the statues come down and there is an end of the transaction. And what do the dead care?

They had saved the people from the beasts, but—never mind; that was long ago.

At times the people of the lowest levels had heard strange sounds in the silent hours of the ennas. It had come to be recognized that these errant sounds were from the maws of the beasts, and it was plain that the beasts were never far away, even though confined safely below. There had been talk of abandoning the lower levels and filling up the tunnels leading to them. But the lower levels had been the homes of their citizens for so long, and they disliked to leave their homes. There was time enough when the danger became apparent. Perhaps it never would.

In point of chronology the reign of terror began with vague rumors and whisperings soon after the landing of the *Terraluna* and the ensuing festivities in celebration of the wedding of Harding and the Princess, and it was not a great while after the work of reconditioning the Crater of Copernicus on the surface had been resumed, when the workers were snatched from their labors and the bridegrooms torn sternly from the arms of their brides, and thrust into as mad a maelstrom of blood and stark horror as a man could survive and retain a fraction of his reason.

It will be remembered that the kindly Altona, king of the Arellian realm, had promised to place their records at the disposal of Harding. Immediately, then, after the Arellians who had assembled to witness the festivities had dispersed to their homes, centering beneath various craters of Arelli, the king had been reminded of his promise anent the records, and some preparations were made to begin with it. In this he was most intelligently and industriously aided by Princess Altara, Harding and Sanna Donelan, as well as, from time to time as needed, by the most learned of the translators of the ancient languages and picture records. The language, as inevitable from the passage of so many thousands of years, had greatly altered, as exemplified in our own domain by the wide divergence between our modern languages and the hieroglyphical inscriptions of the Egyptians, and the cunieform writings invented by the Akkadians of Mesopotamia, which descended to the Babylonians and Assyrians.

By fortunate chance, the white-haired centenarian, Mastono, at the ripe age of 163 years, interested by the ambitious plans of King Altona to bring the people back to live in the sunlight, had left his ancestral home in the old capital beneath the crater Ylisae, on the side invisible to Earth, and come with all his vast learning and experience to live in Copernicus, the present capital of Arelli and the center of the new activities. When he learned of the desire of the visitors to examine the ancient records of the realm, he returned at once to Ylisae to bring from the most ancient repositories of that crater certain records he had encountered while yet a young man.

The Arellians employed formerly two methods of recording historical events. One was what might be termed the regular and orderly writing of history. This consisted of the dictation by official historians of accounts of important passing events into a receiver which impressed them upon, or, more correctly speaking, merged them into the molecular structure of, the fine metal wire or tape which passed through the machine under the influence of an electric field, in something the same manner only recently discovered on

earth. This method had been in use by the Arellians ever since they began to record their history, and the record thus made, so long as it was protected from change in the electric field, was practically eternal—if not in its original, at least by duplications, which were easily made. This method, remarkably enough, recorded conjunctively not only the voice and the related diagrammatic illustrations, but as well the moving panorama of events as they actually took place—in so far, of course, as it was feasible to photograph them.

The other supplementary method, more primitive and disorderly, and probably much more ancient, consisted in recording passing events by pictures or drawings and commendatory writings upon the walls of the numberless caverns and tunnels constituting the sub-Arellian territory and dwellings. The latter, in spite of its incompleteness and lack of cohesion, yet proceeded by a rough chronology, the oldest recordings being found in the excavations first made as the people began to take to sub-surface living, and coming more and more toward the present as the excavations proceeded downward through the hundreds of miles occupied in our time by the Arellians as settlements, horticultural areas, for manufacturing and other plants of numerous kinds, for storage, and the like. These records, also, were so made and protected that they did not suffer from the lapse of the ages.

Keen interest of the two earth men had been aroused, it will be remembered, by the discovery among the pictures and writings on one of the ancient caverns of undoubted references to the now lost continent of Atlantis—"the paradise of Poseidon," as it has been called by one of our writers.

At the close, therefore, of the second erro following the saving of the Princess and Sanna from the clutches of the sinister Ullo and his barbarian henchmen, Harding brought up the subject of the records, and it was agreed that the investigation should begin when the coming enna was over and the next erro was come.

FROM the close association of Arelli with earth, it has resulted that her calendar somewhat resembles our own. The tello, or year, is the same as ours, since Arelli accompanies earth on her annual ellipse. There is no term for century, but a thousand years is called an iltello. The tello contains thirteen nomas, or months, correspondent to the coincidental revolution of the plant Arelli about earth and her rotation on her own axis, resulting in the same hemisphere being always turned toward us. One half of each noma, then, is continuous sunlight, and the other half continuous night. The noma is divided into 28 moras, corresponding with our days, or the observed rotation of earth on her axis. The moras are again divided into periods of activity or labor, called erros, and periods of rest and slumber, known as ennas. Formerly these ennas and erros had consisted of fourteen hours each, but with the advent of surface labor connected with the King's new enterprises, it came rather logically, on a sort of daylight saving plan, that the work periods were longer during the sunlight and the seasons of rest shorter, and the reverse during the long night-times. The erros of the sunlight period were of fourteen hours and the ennas of ten, while during the night period the erros were shortened to ten hours and the ennas increased to fourteen.

At the moment, then, the erro was over and the royal household had gathered in the informal family room where they were accustomed to assemble for their "evenings" together. The party consisted of the King, of Harding and Princess Altara, and of Larry Donelan and fascinating little Arellian Sanna.

The radio and televisual instruments had been connected up, and the daily visit had been made with Billy and Mercedes Upton and their selenographer companion, Professor Merriam, in the Harding Observatory at Arequipa, Peru. The current events of Earth and Arelli had been exchanged. Professor Merriam had become greatly excited about the discoveries concerning Atlantis, and had impatiently demanded that they be followed up at once. Merriam had spent his few leisure hours for some years in studying about the "Lost Continent." He had calculated its civilization and history. He believed he knew its precise size and location, the day, and almost the hour, when it took its fatal plunge beneath the waters of the Atlantic, and was almost childishly eager to supplement—or perhaps only to verify—his own findings.

It had been necessary, therefore, for Harding to promise solemnly, before the instruments were disconnected for the "evening," that he would set about the matter as soon as the enna was over and the erro arrived.

On what we may comfortably call the next "morning," Harding and three of the learned translators, loaned him by the King, met at the airlocks leading from the royal residence into the Crater Copernicus. They walked slowly (for Lano was old) across the eastern side of the newly planted green of the crater's floor, skirted the recently created "Lake Altara," and entered through the airlocks and communication tunnel the vast underground distribution amphitheater, where Harding had been before.

Eagerly Harding led the way to the place in the northern wall, where were the pictures and writings relating to Atlantis, pointed out the drawing of Atlantis, nearest the floor of the cavern, and asked for a translation of the several lines of inscription underneath it. Lano pushed his long white hair back from his brow, gave his robe a twist, and brought his old eyes close to the writing, which was not large. He studied it a while.

"The top line reads," he began, and broke off sharply. "Why, I do not understand how this can be." There was a sort of indignant reproach in his tone. "This is a very recent writing—much more recent than the time of the making of this cavern. Can it be someone is imposing upon me?" He glared suspiciously at Staro and Araso. "The year of the sinking of the land that is shown here is given as the 706th tello of the 207th iltello, and as the present year is 817 of the 211th iltello, or the 210,817th year of our recorded history, that would be only 4,111 years ago. I cannot understand this."

It was rather as if old Lano was set down by the indecent presumption on the part of things of so infantile an age as only 4,111 years, in associating themselves with the vastly greater respectability and validity of the tens and scores of thousands; as if a babe were to invade a class in astro-physics.

Araso cleared his throat respectfully. "It may be that this cavern is of a later making than the other distribution caverns of Copernicus, of which there are several."

"Yes, that would explain it," agreed Harding, with a nod. "I don't suppose they were all made at the same time, and this may be the last one made—or one of the last ones."

"That is reasonable," supported Araso quietly. "It may have been cut out as a more convenient passage than the prior ways of going down to the settlements nearest under it."

"Or it might be, too," joined in Staro, who had not spoken before, "that the walls were not all covered at first, and these writings were added at a later date."

"Yes, yes, of course that may be. Many things may be," complained old Lano, still a little resentfully. "But our friend of Marelli is not interested in hearing you young fellows rattle your heads. He wants to know what the writing means. So if you will please to keep silent a while!" He turned to Harding. "Whatever the reason, this is a very recent writing—only 4,111 years old, as you see—or rather, the sinking of the land it shows was that long ago. This was probably written about the same time. As I was about to say"—he glared at the younger Araso and Staro, whose eyes fell—"the first line reads, 'This is a land of Marelli that sank beneath the great waters the year before this writing is made, which is the 707th year of the 207th iltello.' Then the next line reads, 'The land contained great cities and must have had many millions of people, and the disaster must be a very sad one for our friends of Marelli.' You see, Mr. Harding, the observer in this case appears to have recorded only the larger aspects of the matter. They would record that a continent had disappeared, of course; and he speaks, I see, of the cities, and of ships moving on the waters; but he does not appear to have concerned himself with details. The third line reads, 'But not all of the people died, for they went about much in ships and those who were away in the ships were saved, being perhaps several thousands.' The fourth line says, 'When the people in the ships came back where their land had been and saw that it had sunken beneath the waves, they sailed away to the land at the west.' That is all of the writing. It is not much. But you see, this is not a history of Marelli, but of our own world, and I suppose it was put down merely as a passing reference to an event of some interest, it being an unusual thing for a great land to sink into the sea."

"I see, of course," said Harding. "The land was called by us, Atlantis. The sinking of it occurred before our authentic history, and while there have been traditions or reports of its existence, we could not say whether it really existed or whether it was only a myth or a fable. What do you make of the picture above this?"

THE picture above showed the west coast of Africa, and the inscription merely said that the sunken land had been to the west of there. Staro suggested modestly that the regularly recorded histories of the year might refer to the event, and said he would examine them.

The mural frescoes and writings on every side dealt with more ancient times, and no other reference was found, after some little looking about, to any events of Marelli. As the examination of all the inscriptions would have required years, it was decided to try one of the other distribution amphitheaters, in the hope of chancing on something further of interest to the men of Marelli. They went back through the airlocks into the crater to enter the next station, which was on the south side of the crater's floor. Staro left them there and went to examine the records, as he had promised.

It will be thought that the examination of the records covering a period of over 200,000 years might be a herculean task; but this was not so. Staro merely selected the section dealing with the 207th thousand of years, and easily found the 707th year of that thousand. Attached to the file for each year was an alphabetical index. So he had only to select the letter desired—in this case "M" (or whatever Arellian letter corresponded to the sound) for Marelli. He turned a key and a switch, there ensued a whirring inside, and a voice began to recite the subjects included under the letter in question, with enough of the context to render them intelligible. Hearing the name Marelli, he noted the number opposite and referred to the corresponding number in the main body of the records. Another turn of a key and a switch, and the voice came to him from the thousands of past years as clearly as if speaking from his very side. These voices from the dead past had always filled Staro with an eery feeling he had never entirely overcome. In his boyhood he had delighted to turn on the records of the ancient times, looking at the procession of pictures and listening to the voices, trying to supply the accompaniments of feature, figure, disposition and surroundings of the speakers—all, alas! departed ages before. One would sound young and vibrant, and he thought it was a pity that one had had to die. Another would seem to possess a certain quality of experience and middle age; another quavered as if with great age. Some sounded calm and content, some petulant, as if resenting the boy awakening them from their age-long rest. Some were casual, some stern. Some of the historians had been women. In one such case her picture was flashed. He had been surprised to find her young, comely and smiling. She had touched his young fancy deeply, and he had leaned eagerly forward, only to recoil, chilled unpleasantly by the reflection that she had aged and died thousands of years before his birth. It seemed to the thoughtful lad so incredible, so tragic and terrible, that all alike must cease to live; and withal so mysterious and ghostly that after they had filled up their little destiny and centuries before had crumbled into dust, they could yet speak again at the mere turn of a little switch.

"The planet Marelli," the ghost voice began. "A great catastrophe on the planet Marelli has been noted by our observers. The entire continent known to us as Essanto, to the west of the continent of Alparo (Africa) has sunk beneath the waters, although the sinking was not seen by us. This continent is known to have reached an advanced stage of enlightenment, according to the standards of Marelli, which are far below our own. The people of Essanto, numbering many millions, had great cities and public works. After the disappearance of Essanto, our observers watched the spot constantly for a long time. The people of Essanto traveled much in ships to all lands of Marelli, and in this way a great many were saved from death. After a time the ships returned, one by one, to the place where their home ports had been, until at last a gathering of ships was seen sailing about the place. After quite a long time, the entire fleet of ships sailed away to the west to another land, where we can only suppose it is their intention to establish a new home for the remnant of their unfortunate people. *Intaxit es anna Essanto sn' Marelli.*"

(The Arellian word is not translatable into our tongue, but the sentence signifies a sorrowful apostrophe to the distant "friends of Earth on account of Essanto.")

This being the extent of the account, and finding no more of interest to the inquiry, Staro readjusted and relocked the record cabinet as he had found it, and returned to acquaint Harding with what he had heard.

The Princess Altara, the petite Sanna, and Larry Donelan had joined the others in the crater.

There are six so-called entrance or distribution amphitheaters leading underground in different directions from the floor level of the crater Copernicus. It should be remembered that the floor of the crater itself is many thousand feet below the rim, and that the country backing the rim, unlike our own volcanic craters, slopes rather gradually from the top of the rim outward, so that on passing from the floor of the crater horizontally into the surrounding cliffs, one finds oneself already several thousand feet underground.

Of these distribution centers, four include tunnels for travel from Copernicus to various other inhabited craters, as well as for access to the local underground dwellings and settlements; two are only local. Harding, accompanied now by the scientists, old Lano, Staro and Araso (the centenarian Mastono not having returned yet from Ylisae), and by the Princess Sanna, and Larry, visited three of these before finding anything of particular interest. It was only when they were about to leave the fourth and give over the search for the time being, that the sharp eyes of Sanna caught, far above them, the word Marelli in large characters. It seemed, from its position, to be a sort of heading for several broad parallel columns of inscriptions extending down nearly to the floor. Interspersed among the inscriptions were various illustrations on a rather small scale. It seemed as if the recorder were pressed for room or not greatly interested in his subject, for the writing was too small for them to read from where they stood except the single word Marelli, and it took sharp eyes to make out even that.

At any rate, as the deciphering would obviously be a matter of considerable time, and other matters were intervening, it had to be postponed.

SEVERAL days passed during which the further translation of the newly found records on the walls of the amphitheater was of necessity postponed. The King was kept busy with many things, not the least being matters pertaining to the new surface works, which he continually supervised in person. Old Lano had been compelled to take a trip on some educational tour to Tycho. Harding and Larry were happy looking about here and there.

Larry and Sanna found material, built a raft, laughing gaily the while, and went for a cruise on Lake Altara. The intelligent little Arellian girl asked a multitude of questions about her husband's home planet. Larry described things on Earth the best he could. One might go where one wished. There was plenty of air to breathe—everywhere! All over the Earth. Yes, and water. There were not only the great oceans, on which, of course, thousands of ships went, but there were fresh water lakes so large that one might sail out of sight of land. There were rivers so large that there would be room on them for vast fleets. Some of them were miles and miles wide. There were buildings a hundred stories and more high, and the air was filled with swarms of airplanes. Yes, there were flowers, of course—great gardens and fields of flowers and grass. In many places the flowers grew wild—that is, they grew of their own accord without seeding or tending. There were forests so large that one might get lost in them and never be found if one were not careful. There were myriads of fishes, big and little, in the oceans, the lakes and the rivers, and millions of birds that flew in the air. Some of them sang very sweetly, too.

"How big is a fish, Larry, dear?"

"O, all sizes, from the size of my finger up to half the size of the Terraluna."

"O-o-oh! Larry! Honestly? And do the people not fear them?"

"N-no, colleen, they were harmless as long as one kept out of their way. The big ones—whales, they were called—were only in the great oceans, and one went on the oceans only in large ships. There were small whalelike fish that ate people when they could catch them—the sharks, but—well, one kept out of their way, that was all. There was no trouble about that."

"And, Larry"—she was breathless with the wonder of it—"Larry, you said the—the *birds sing*? I do not understand how that is. Do the birds of your country—the Uni—it is hard for me, Larry. Tell me the name again."

He kissed her, called her a sweet thing, and told her the United States, and she struggled with it until she got it, watching Larry's lips attentively.

"I am stupid, am I not, Larry, dear? I have never seen a bird. Do the birds in the—United States—do they sing in your own languages? You say many languages are on Marelli. Do the birds of each country——"

Larry laughed, kissed her again, and explained, and then they laughed together, to think she had never seen a bird and thought they sang in words, like people. Then she told him, "Larry, I love you so. You are so—you are a—a sweet thing." She said she could never live an erro or an enna away from him, and then his face became so sober it frightened her. She leaned close, with her arms about his neck and her clear eyes searching his, a little puzzled. She shook him gently. "Why do you look—so strange, Larry, dear? I would rather go to—to the beasts with you, than be anywhere without you—even for a single enna."

"Why, colleen," he told her, "it is nothing to make you look so sad. It is only that they are building now a new ship at Altara Mountain—a bigger one than the *Terraluna*. You know about it. Well, I do not think they can finish it without me, so I must go over and help get it done. That I must do soon. But I will come back in a little while, dear one."

Well—she puckered her lips adorably a moment—well, Larry, the Terraluna would hold two. It had held him and Freddie, and she was much smaller than Freddie. She would go with him.

No, little one. The journey was not safe—that is, not comfortable enough, yet. It meant being shut up in a very small space and hardly being able to move all the way. When the larger ship was done——

But—she picked out that about the comfort with unerring instinct. Larry had not caught himself quickly enough for her sharp wits. But—it was as safe for her as for him. She would go.

Larry shook his head. Not this trip. Maybe the next one.

She stood up straight, her little face suddenly gone tense and white. Then she would die—at once! Without so much as a second's hesitation, to Larry's surprise and horror, she had flung herself overboard from their play raft into the lake, which was deep at that point, thrown up her little hands, and sunk.

Like a flash he was after her, and soon managed to seize her clothes, but she struggled and they tore away in his hands, so that she sank again. Diving, he seized her again, and brought her to the surface. But she fought to tear herself out of his grasp. Larry was not a strong swimmer, and it was with vast relief that he lunged out and caught the edge of the raft with one hand. He drew her upon it and held her fast. At last she lay still under his caresses, looking up at the unmistakable trouble in his honest eyes. In a moment her lips parted.

"I will go, Larry."

In spite of himself, he laughed, and he snatched her to him so fiercely tight that she let out a happy little gasp.

"Yes, colleen, you will go."

Larry made no mention to anyone of the events on the raft, and if Sanna spoke of it to Altara they both kept their counsel. Each time when night was upon the Earth, connections were made with Altara Mountain. Since the rather astonishing marriage of Billy Upton and Mercedes, Mercedes had spent her time between the Mountain and her father's place on Lake

Titicaca. They were greatly excited, they and Professor Merriam, about their coming trip to Arelli on the new ship, which was being built under the long distance supervision of Larry. The work was progressing rapidly, but it turned out, as Larry had expected, necessary for him to make the trip to Earth for the completion and fitting.

There was no more argument about whether Sanna was going. Larry had spoken to the Princess about it, but she had been as decided as Sanna, and that had settled the matter. Apparently the girls of Arelli belonged very much to their mates—and expected as much in return.

"Sanna is right, Larry. You do not know the girls of Arelli. You will kill her if you leave her behind. They know men with a great certainty, and having chosen there is no changing with them. If you are both to die on the way she will die content; but if you leave her, whether you die or live, it will kill her. Sanna is right, Larry."

ONE evening, when they were all gathered together in the royal quarters, the Captain of the Guard was announced. His face wore a look of grim trouble. He asked to see the King alone, and the King received him in a small officelike place near by, where he heard his story.

A party of workmen, he said, had been engaged in boring new wells on the lowest level. A boring machine had suddenly broken through into a natural cavern. The well had to be abandoned, of course, and another started elsewhere. Through somebody's neglect the thirty-inch hole had been left open for a time, and when at last a party of five men had been sent to close it, only one of the party had returned.

The tale of the survivor had been a wild one. He had been in such a pitiable plight from fear and panic that he could hardly speak at all, and even then had not seemed more than half aware of his words. Continually he would break off, shaking as with the ague, and peering here and there as if expecting some terrible thing to leap upon him and destroy him.

The story they had finally got out of him was that five men had gone to close the abandoned hole. Their first step had been to let a man down into the hole in a cage, taking metal bars, which he would put in place in such a way as to keep the filling from falling through into the cavern below. Then broken rock was to be put in until the hole was filled to the top.

The hole being too small for the convenient use of gravitors, a windlass had been rigged at the mouth of the hole. One man would get into the cage, and another would let him down to the desired position. While this was being done, the other three went to prepare the crushed rock for the fill, two running the crushing machine, and one taking it in a sort of truck to the hole. It was the truckman who was the survivor of the party. The crushing machine was some distance away, and out of sight of the hole.

When the truckman arrived with his first load the windlass man was not in sight. He had waited a while, thinking he had gone to attend to some little matter and would return shortly. Impatient at last with waiting, he had gone and looked down the hole. He was surprised to find that the light, which had been carried down in the cage, was out, and called down to ask what was wrong. There had been no reply. Then he had noticed for the first time—it was strange he had not seen it at the very first—that the cable had run out its entire length into the hole. This was not reasonable, because it was twice as long as necessary. Alarmed at last, he had run and called the two men from the rock-crushing machine.

One of these immediately proposed to go down the cable to the cage to see what was wrong. Perhaps the cage man had been hurt in some way. Perhaps the windlass man had gone down to help him, and both had got into some difficulty. He would soon find out. First making sure the cable was securely attached at the windlass, he had attached a clutch to the cable in which were loops for the hands. Securing his light, he had swung over into the hole and slid downward. The two on the surface had watched the descending light but a short distance when it, too, had suddenly gone out. They had heard a muffled scream and then silence.

Urged to go on with his story, the truckman had trembled so violently that it had been some time before he could speak again, and then hardly intelligibly. He could not tell what had happened after that. His sole remaining companion had lain down on the ground to peer into the hole. After a bit, without looking up, he had asked the truckman to bring him another light, on a cord. He, the truckman, had turned away to secure a light and was attaching it to the cord when he had heard a sort of choking gasp from the man at the hole. Turning quickly, he had been just in time to see his feet disappearing into the hole. They were in the grasp of something that looked like a tentacle, but he had had only the briefest, fleeting glance at it. Then the tentacle and feet had disappeared together, and he had turned and fled screaming from the place.

That was the story the Captain of the Guard told the King, who heard him in thoughtful silence.

"Did you hear the story yourself, Captain?" he asked.

"O, yes, Your Majesty. When word of the matter was brought me I sent for him at once and examined him carefully."

"And do you think his words are true?"

"Yes, I do, sir."

The King nodded. "And the hole?"

"I went myself immediately with workmen and closed it."

The King looked a question, and the Captain shook his head. "I saw nothing unusual, sir. I merely reamed the hole to a larger size for some distance down and dropped in a rock the size of the larger hole. It could go only to where the hole narrowed, and I had them fill on top of it. That is what the workmen should have done in the first place. It was awkward of them to go at it as they did, but I guess they did the best they knew how, poor fellows."

"Did you search the lower level, in case any of the beasts had escaped and were still at large?"

The Guard Captain nodded. "Yes, I did search thoroughly, sir."

"You dragged the storage reservoirs?"

The Captain started. "No, Your Majesty, I did not. The truth is I did not think of that."

"Better do it, Captain—just as a precaution. It may not be necessary, but—better do it, anyway, when you get time. We know nothing about these beasts. They were probably water creatures originally, and when the seas dried up they made their way below in some way, and if the beasts have tentacles, it may be that they are still water animals. No doubt there is water down where they live. Better drag the reservoirs, though I don't suppose— Report to me personally, Captain. You did right in coming direct to me."

HARDING had assumed, rather as a matter of course, that he would return to Earth with Larry Donelan, attend to some business matters, and return to Arelli when the new ship should be completed, with Billy and Mercedes Upton, and probably Professor

Merriam. He did not relish leaving Altara, even for a day; he very much wanted to go ahead with the records they had found; and for some reason he found it difficult even to approach the subject of going, in speaking to the Princess. Larry had said nothing to him about the matter, for reasons that are fairly obvious. But Harding knew he must speak of it to his lady, particularly as he realized each day that the trip would have to be taken soon. So he introduced the subject one day when he was alone with Altara.

"Sweetheart," he began, "you know the people of Altara Mountain can hardly complete the new ship without Larry's help. It will be necessary——"

He could not see her face, because her head was on his shoulder, and her face was close to his neck. He could feel the soft movement of her lips just touching him.

"Yes," she said, "I know, my dear one. I am sorry Larry has to go, but I suppose it must be. He and Sanna have spoken to me about their preparations."

There was something about her tone that made him take her face between his hands and look intently into her eyes. She put his hands away in a moment, to lay her head back where it had been before. He could feel her lips again, but she said nothing.

"Of course, dear, you know I ought to attend to some business matters at the Mountain. I have to—there are some—you see——"

He could have sworn she was laughing, but when he looked at her, her face was straight enough. He must have been mistaken.

"Larry says you are terribly rich, dear. I am so sorry. It must be a source of great annoyance to you. But when Larry gets the new ship done, and he and Sanna get back—O, yes, and Billy and Mercedes! O, Freddie, I do want to see them so! And that dear Professor Merriam! My father is very fond of him. Mercedes is so sweet, too. I can not wait to see them all face to face. I am so eager to see your Marelli, too, Freddie, my dear one. Well, I will have to wait till the new ship is done and Larry and Sanna get back. I am sorry, though, that Larry did not make the *Terraluna* bigger, so we could go to Marelli now."

There was silence a moment. Then, "Freddie, my dear, I love you so. I could not live a single enna without you. I shall die if you ever leave me for a—for a—what is that?—for a sec-ond."

There it was again. Harding drew her golden form close and kissed her. He decided to have a talk with Larry first. Altara spoke as if everything were settled, and he hardly knew what to say. These girls seem to love a little harder than the girls of Marelli. Yes, he would see Larry first.

Before long he and Larry did have a long quiet talk—perhaps a little confidential as between man and man anent woman and woman. The last words clear the whole talk. "So what can we do, Mr. Harding?" "Yes, Larry, I guess you're right. What can we?"

From all of which it is easily apparent that Larry and his little Arellian were the sole passengers on the *Terraluna's* return voyage to Marelli, which was made in twenty-four hours, and followed by a perfect landing on Mountain Altara, between the observatory and the hangars.

Of course it was quite unavoidable that others of Marelli had come to know of the interesting events. And since the daily press had acquired in 1938 even more exceptional ways than in former decades for finding out things they wished to know, it was inevitable, too, that they ferreted out the transaction entire. They proceeded jointly and severally to Altara Mountain, by automobile, airplane, boat, train, and all but subterraneously. They alighted upon the quivering shoulders of Professor Merriam and the Uptons, like a swarm of destroying termites. At last, after some conferences with Arelli, the Professor made out a set written statement, giving out such facts only as they desired to disclose and no more. In spite of this paucity of accredited information, though, it was not to be expected that the journals would fail in such intimately pleasurable details, as the fact that the Princess affected neither stockings nor cosmetics; that she was innocent alike of smoking, drinking, and permissible profanity. On the "best authority" it was delicately given out that she even did without the tiny crimson swastikas on her cheeks and the bracelets of paint about her wrists and just above her knees, that went so far to establish the character and desirability of the females of Marelli.

When the world is in on your secret, there is no secret; when the world finds out where you go for your pleasures, there are no pleasures; when the world finds out where you eat (if you are anywise famous for anything), you have no longer any eating place; when the world found out about Arelli, the world wished to go at once to Arelli. The reporters dreamed of unprecedented "scoops." The minerally minded felt there was gold there. The scientists dreamed of new bugs they might label and catalog, and designate in Latin with their own names attached as a sort of affidavit to their importance and validity; or they saw new fields of geology (or lithology, at least) to explore; or —whatever their specialty might be. Indeed there is some support for the assertion that the discovery by one Smith S. Smith of the avis Smithii or Arellian nightingale, considerably antedated the discovery that Arelli was birdless. And this despite the authentic description by Smith S. of its last note and feather.

Yes, certainly, the world wanted Arelli ardently and at once. But how go there? They knew a ship had already been there. They found that another was building to go there again soon. They besieged Altara Mountain and high heaven for passage. Being told that the man who owned and controlled the whole transaction was off the Earth just then; they tried all manner of ways to get to him—without success.

The Altara Mountaineers would gladly have closed up the "plant" for a while entirely and taken refuge with President Gonzales at his Titicaca residence; but they dared not. They knew too well the place would have been literally taken apart piece by piece by the *genus* souvenir hunter and related fauna.

By reason of which the arrival of the *Terraluna* was arranged for the nighttime, and the secret of her coming guarded with care. They did succeed in arriving secretly, but the secret could not be kept. The very breezes wantonly broadcast it. And the whole swarm was up the Mountain after them the next day. Indeed, to insure even the safety of the very ships themselves, President Gonzales had to send a hundred military guards to surround the hangars.

The little Arellian Sanna had so many new things to see and learn! Mostly she was enchanted. She saw the birds and heard them sing and laughed happily again at her first thought of them singing in words. The warm-hearted Spanish-American, Mercedes, took her to herself without reserve. That was good. That she must learn to stay with Mercedes or others while Larry was absent for hours at a time in the shops and hangars—not so good. But she was brave. The ways of Marelli might be strange, and at times even a little hard in some points, but they must be hers, even as Larry was hers. Professor Merriam she adored, as he did her. Billy Upton she thought nice, too, but her incomplete knowledge of English often made it hard to follow what he said. It had been comparatively simple that "kid" and "colleen" signified nice little girls,

but that "olcheese" and "olbean" and "olhorse" bore somewhat related meanings as to men, and "tiddlewinks" and "honeybunch" and "morning glory," as to women! It made her earnest little brain whirl, and she could hardly get the time to set them down and study them, so that she might know well the authentic tongue of the Irish lad she so adored.

LARRY worked hard and earnestly. He gave his men double pay, with generous bonuses for efficiency. He coaxed and praised and drove them. It almost seemed as if he were possessed of some mystic Irish flair, or hunch, or what not, that the ship must be done quickly—quickly!

And so it turned out, for the news that crossed the void that night from Arelli was disquieting enough.

It was on the lowest level again. In the quiet of the ennas, when the bustle of labor and traffic was stilled, and there was no sound save the soft whir of the giant pumps, working unremittingly through the erros and the ennas to send water up to the surface works which were to make them a new world, and to the upper levels where no water was to be found—in the quiet of the ennas, strange sounds began to be heard. The people of the lowest levels had heard the like before—true, but then the noises had always been muffled and had seemed far away, bearing the calming suggestion of safe barriers of solid rock between. But now they were different—now they were different. They were not muffled. It was almost as if they might be at the very doors, slimily discussing and perfecting among themselves unspeakable revenges upon the puny beings who had kept them imprisoned so long in their hells in the oppressive bowels of Arelli.

One had but to listen at any time to hear the voice of one like the mad, leering laughter of a tortured fiend, and it might almost have been fancied he was laying upon his foul plea the emphasis of hungrily curling serpentlike arms. "Ha, ha-a-a. Let me but get a few of these odd beings in the hug of these arms. Ha, ha-a-a-a-a-ah!"

And one could see, then, the longer, slimmer member of the hideous group—more terrible, if such a thing could be, than the first—opening his cavernous crocodile mouth as he padded wetly up on his short, flabby legs to concur in the horrible leer. "Put me but one of them—a young and tender-fleshed one, by choice—in these capable jaws, and I will answer for it."

Whereupon, with a hiss so daunting as to startle even his foul companions, the serpent whirled silently between, and raised his fiend's head, from the pouches about which the slime oozed and dripped disgustingly. "S-s-s-s! S-s-s-s-s! List, my old ones. I speak little, but—S-s-s-s!" With a lightning flicking out of a famished red tongue, and a gleam from eyes that froze the blood, he rustled along, as the others drew out of his way.

"But," counseled the ancient dean of all hells, so old, so shriveled and loose-skinned, so unutterably evil and merciless that he might have lived eons before in the black depths of the surface seas when Arelli was young, "but hist, my children all—you of the many arms, you of the massive jaws, you of the slender coiling form, and all of you of the pack—list, my good children all, to one who was old before ever you licked a drop of sweet blood upon your chops. We have had a feast or two. Well. But you must wait a bit. We are not many yet. The little round door to this new world was shut too soon, and more of our fellows cannot come from below. But"—his voice sank to a rattling, croaking whisper that made even the serpent draw back—"we shall soon be myriad. In the safe places I have found our kind are multiplying in thousands. In a while it will be in tens of thousands. Aye, if we can keep away from destruction for a space—millions, millions! Then, my sweet children—ha ha—then, *then* will we fall upon these sweet-tasting ones, and——"

At some slight sound they slunk away, each watching the others with evil, calculating suspicion in their lidless, unblinking eyes.

All that, multiplied many times, one could picture from the soul-shaking sounds that shattered the quiet of the ennas, overreaching the soft whir of the great pumps that were making a new Eden for the Arellians—all that, and be, perhaps, far below the facts.

Gradually the people began to be stricken with panic. The tale of the missing laborers at the abandoned well was told over many times, and yet many more, gathering force and circumstance from each retelling, until, from the sheer horror of it they must perforce talk of it in hoarse whispers, with furtive glances over the shoulders.

It was said the worst had been suppressed, that many others had been taken by the beasts, of which losses they had not been allowed to know; that the King, bless him, had not wished to alarm or distress his subjects unnecessarily, and so had interdicted the telling of certain matters.

Singularly enough (or perhaps naturally) for a people where water was scarce and valuable, the Arellians were fond of bathing and swimming, and this had been permitted in such of the storages as were used merely for irrigation. Indeed, storages had been installed on all levels to be convenient for the purpose. Swimming and aquatic parties were common, and had become a favorite form of sport.

It will be remembered that the King had directed the Captain of the Guards to drag those storages—since it would have been unthinkable to empty them—to make sure that none of the beasts had found refuge in them. This the guardsmen had set about diligently; but in the hundreds of miles of depth below the surface there were multitudes of the great tanks, and the guards were few in number, the people being peaceful and loyal. Therefore the work at best, was a formidable one, requiring many erros to complete. The Captain had reasoned, and very intelligently, that if any of the beasts had got at large, they would be in the lowest levels, nearest their dens. So reasoning, he had started in the lowest level, planning to work upward. There could, therefore, be no blame to attach to him for the tragic happenings which occurred but a few erros after he had received the King's directions, on a level many miles above the lowest one. No more could blame be put on the King for not forbidding all swimming in the storages. The searching of the reservoirs had been at best a matter of extra caution, really never meant to apply to more than a few of the levels lying nearest the bottom of civilization.

A few of the young men and women had had a party at the reservoir in question. These places were, in a way, pleasure resorts—beach resorts—and there were places for lounging and taking refreshments between plunges. Some remained longer at the pool than others. Nothing alarming was apparent to any. There was no faintest supposition that any horror lurked in the middle of their gayety. No tentacles swished through the water to seize a victim. There was no fear in the heart of any, so far as known.

When one of the party looked for another and failed to find him or her, it was merely supposed the one sought for had gone home. As the event drew to an end, departures had been frequent, until at the last, as in every sort of gathering, but a few remained, and only a bare couple or so in the water. Those on the

What they saw made their blood run cold. A young girl was struggling below the surface.

shore gave them no attention. It was only because of a slight gasp or exclamation, common enough, too, in the water, that a lingering pair of insatiable lovers on the bank had glanced casually at the two in the water.

Then the horror fell upon them, for what they saw was a young girl, drawn struggling under the surface, in the grasp of tentacle-like arms; and then, as her lover sprang to her, another curling arm had taken him with her. That had been all. Then there was silence in the pool.

THE alarm was given by the horrified lovers on the bank, but the place was almost deserted, and in their panic and terror no one thought to give the alarm, where it should have been given, but only to flee from the place with all speed that could be made.

When at last the word reached the Captain of the Guards, he sent a messenger to go quietly and see the King alone and tell him of the tragedy and that he himself would report as soon as possible. Others he deputized to make a careful check of all the persons known to have been in the swimming party, and learn what ones had returned to their homes, or had been accounted for. Then he headed a company of his best men to the place of tragedy. They were heavily equipped with every weapon that could be of avail against the terrible unknown enemy.

At the tank, they set lights to penetrate the water; and with glasses of special make they scanned the bottom, which showed every inch of itself as plainly as a man's hand before him. But there was nothing there. No need, said the Captain, to drag it. There was nothing. So they went away, wondering, no wiser than when they came.

But the check showed a full dozen people missing, with the possibility of more.

A consultation was in progress at which the King, Captain Tullos of the Guards, Harding and Altara, and others were present, including old Mastono, who had just returned from Ylisae.

"It is strange there were none of them in the tank. It must mean they have hiding places we do not know of." It was Tullos. "I have gathered extra guards in numbers, and stationed a group at each of the larger storage reservoirs ready for them. I have a group guarding every tunnel between the stages to see if we cannot catch them passing from one level to another. I have issued arms to all and they are being taught the use of them; and they have been warned to venture nowhere except in groups, and no women or children except under guard. The gardens are being patrolled to protect the men at work; the houses are all being protected; the reservoirs are being dragged or examined; and I do not know what more to do."

"You have done well, Tullos," commended the King. "There is no blame attached to you. I could not have done more myself. For my part, I have ordered the construction of as many houses on the surface as the crater will hold, and as they are completed we will move the people into them, beginning with the lowest level. Much of the rock for the buildings was quarried long ago. Ten thousand men are at work on the foundations and ten thousand more will begin work on the houses at the next erro, and they will work in shifts both erro and enna."

The Captain started up sharply. "Then I must go at once and begin getting them ready to move, Your Majesty."

"No, Tullos," said the King, staying him with a gesture. "Your hands are more than full. I am having others do that. The first ones are already preparing and will begin moving at once. Some may be already on the way up. By the end of the next erro the lowest level will be empty, save for those who have work to do there, and they will be guarded. Every erro one level will be emptied. We shall have to learn how far up the beasts have got."

"But there will be some danger in bringing so many people to live on the surface, Altona," objected the centenarian. "The atmosphere is not quite secure yet."

"Yes, there is some danger, Mastono, but not much, I think, and we must take that chance. I myself shall sleep on the surface to watch the people and give them help and confidence."

"Bravo, dad!" cheered Harding and Altara. "We will be with you."

"Thank you, my children, I foreknew as much. I have taken special precautions and it will be pretty safe, but for the present the houses will be furnished reserve supplies of oxygen, and arrangements for closing them hermetically—also for heating them—in case of any interruption in the atmosphere."

"It would be wonderful to sleep under the ancient stars, Altona," said Mastono wistfully. "It is a thing I have never done. I wonder if I may have a place among them."

The King smiled fondly at the centenarian, who had been his tutor in childhood and youth, and his chief adviser and loyal friend in his high office. "Knowing your spirit, my friend, I have your place already appointed next my own. Captain Tullos, you also I must have at hand. The other members of my household will remain where they are for the time. We must give the houses to the frightened lower settlements, as fast as they are ready."

Harding had perfected his knowledge of the language of Arelli, so that he used it quite conveniently now, and had little difficulty following the proceedings. There was speculation as to how many of the beasts had escaped while the abandoned well had been left open; as to how they had made their way unobserved to the higher level where the tragedy of the aquatic park had taken place; as to how many levels they might be lurking on, and where; as to whether and how they multiplied; and many other things.

No one had an answer to any of the questions. There was no way of knowing, except by ways that were being taken already. It was unnecessary to lay a prohibition on aquatic parties, now. No one could have been persuaded to go near the reservoirs, except those who had to perform duties there.

Harding had been thoughtfully silent. He made a suggestion now, addressing it to Captain Tullos. "Captain, if a man from a far away world may make a suggestion"—The Captain nodded cordially—"Had you considered that these creatures would be likely to be, or at least might be, invisible while in the water, and that a mere examination of a reservoir might not reveal their presence?"

"No, I had not, Mr. Harding," admitted the guard with a guilty start.

"Nor had I, Freddie, my son. Tell us about it."

"We have on Marelli creatures of various kinds that are transparent while in the water. They cannot live out of the water and die if exposed to the sun. It might be that these creatures on Arelli are the same, and if they are invisible, nothing but dragging would show them up."

The hint was taken as a valuable one, to be acted on in future searches.

"You are a great man, Freddie, my dear one," asserted the Princess, kissing him without shame or compunction, "a great man."

The gist of these portentous events had been received by Larry and Sanna, Billy and Mercedes, Professor Merriam, and their inside friends of earth, dur-

ing the strange daily visits between the two worlds.

"Didn't I tell you, Billy"—it was Larry that spoke—"that there was a reason for rushing the work on the ship, even though I didn't know what it was? Perhaps you'll not laugh at my Irish hunches so much now."

Upton laughed. "Perhaps not, olhorse, though I laughed, not at you, but only at some of the things you said. There's a big difference, you know. Almost as big a difference as between a big green spot—pardon me, I mean an increasing green spot, I think—between an increasing green spot and the ordinary garden variety of green spot—something like that. *Vide*, confessions of Frederick X. Harding."

THEY laughed together companionably, though with a touch of anxiety in the background, and Sanna, always waiting to laugh, joined, though not more than half comprehending what Billy had said. It was enough that Larry laughed. Professor Merriam, albeit his old eyes could almost have been thought to twinkle—smoked and maintained the silence of age. Mercedes was up on the lake for the day, and Sanna had wondered the whole day long how it was that Billy could be gay in the face of such a calamity. She loved them all dearly, these Marellians. They were very sweet. But in spite of their sweetness, the ways of Marelli were not—well, not *quite* as those of Arelli.

At the moment Sanna was thinking those things, Harding was having a quiet talk with old Mastono before retiring for the enna. The King was about other things with Tullos. Altara was content to sit silently with her head on Harding's shoulder, her lips moving from time to time softly against his neck. Harding and Mastono had found a great liking for each other, and Harding had been wishing for this chance to listen to him. He reminded him some way of Merriam, on the score of his broad wisdom, his sly sense of humor, and his grave kindliness. Mastono and Merriam must meet.

He could see just how they would complement each other. Merriam had impressed him often as a lonely man in some way. Mastono the same. And it was even then passing through Harding's mind that the great are often constrained into loneliness, in the beginning, because of the necessity of excluding themselves from free association with their fellows. They must do so, or they could not have the time to become wise and great. They must have their time to work—to work by day and to work by night. Only so could they become great and wise. And then, in the end, when they had taken on wisdom and greatness, then instead of withdrawing themselves from their fellows, their fellows withdrew themselves from them. The usual man does not seek nor care for the company of those he cannot understand; those who speak deeply of things he cannot comprehend. Yes, thought Harding, as he sat listening to the wisdom of Mastono, and at once thrilled by the presence of the warm body of the golden Princess in his arms, and the lips of her at his neck—yes, he thought, greatness was constrained into loneliness, because of its very self. Let not the man seek greatness who would have the song and the dance of life; the laughter and the lightness; the bodily thrills of wine and viands and pleasing gustations; who would live their lives in the company of gaming and play. The two lie along separate highways, and the highways end in different countries. And in the end, when pleasure and wisdom meet, they are become strangers and cannot well comprehend each the other. For what have the frivolous to do with the universe and all its separate atoms? The bacteria and the blood? Or with electricity, or magnetism, or time and the deep curve of space? And what has the scientist in common with the frothy prattle of the debutante and parties and pink teas? Of "society" and cards and clothes? Of the paint and varnish with which these butterflies have chosen to cover the things he has made possible for them—covered deep, deep, so that their tender eyesight may not have to look upon the primitiveness of the things he loves?

These things flashed through Harding's mind in an instant. And he added the thought that in these days the scientist still might mate, because there were women who knew how to mate with the scientist, and still complement him, even as he had known Mastono and Merriam would complement each the other; even as this Royal Princess of Arelli. So that at last love and learning might go forward hand in hand to the goal of accomplishment. But Mastono was saying——

"Civilizations and science wax and wane"—the old man smiled gently—"and the interests of men, like the interests of children, change within comparatively narrow limits of time. It is known that in remote ages the Arellians were able to observe affairs on your world in minute detail; but then that ability passed away from some cause and was lost, and it was only long afterward that it was recovered. How these things happen we do not know. The cycles are too long for us. At the time, a group of men was interested in the particular thing; then it may be that the instruments were destroyed and the men who had their secrets perished with them. Or, it may have been the result of some barbaric triumph over civilization; it may have been the result of various kinds of fanaticism against science; it may have been the result of some other disaster, which set the whole civilization back into the far past; or, perhaps merely some overpowering interest called attention away. All that is only speculation, but it is certain that my people once possessed that ability, and lost it."

"Or, it may be," put in Altara, when they had thought her all but asleep, "that Arelli passed through some inhospitable region of space that killed all her people."

"It may indeed," said both men at once, surprised and pleased.

"But that would have carried with it the destruction of all life in the solar system, including Marelli," objected Harding.

"That may indeed be," mocked Altara gently, "or most of the life. But it is likely the marine life, or some of it, would have been saved, and all life came from the water in the beginning, anyway. It would mean only that evolution would have to do its work over again, but that is only a matter of time, and time is not important in universe matters."

There seemed no answer to that.

"How far does your knowledge of life on Marelli extend, friend Harding?" asked the centenarian.

Harding hesitated a moment. "Well, our scientists can trace man from the time he first evolved from the ape-man, about the beginning, or just before the beginning, of our great glacial epoch, perhaps half a million years or more ago, right down to the present."

"Oh! I did not know that," said Mastono. "I had understood that your history was comparatively recent."

"Well, so it is—our history; but they trace him through fossil remains they have found from time to time, you know. They say that the very early rocks show no signs of any living thing, or of any chemical deposit that would indicate the presence of life, and they say that at the time those rocks were laid down there was no life existing on the Earth. They call those rocks the Azoic Rocks, or Lifeless Rocks, because they are supposed to have been the result of the sinking of the first crust of the Earth, when no life had come yet. They find, then, above these Azoic Rocks others that do

contain signs of the presence of life—primitive life. They begin there and trace right down—with some rather important breaks, to be sure—first through the fossil remains found in the rocks, and then, as men evolved and progressed, through the implements and things they find buried with the human skeletons, and finally, as man became a primitive artist, through the drawings on the walls of the caves, until gradually they get down to where our authentic history begins. Of course, when it comes to actual historical writings, we have none of any great age—nothing at all comparable to your marvelous records here on Arelli."

THE centenarian sat musing a moment, then suddenly: "You speak of your glacial epoch. How long did that last?"

Harding blushed. "Why, I—of course that is hard to say. I am not informed technically on such matters. Whole lives must go into those studies, and we of other departments cannot work their problems through, but only pick off here and there casually a few of the answers they have set at the end of the book. But I think there is considerable difference of opinion."

"How wide a difference, may I ask?"

Harding laughed. "You have me there. It seems to me I have read that the estimates run from 100,000 years to as high as 800,000 or 900,000 years."

"And why so great a difference?" It was almost a whisper.

"Why? Why, because they are not sure."

"Yes. They are not sure; and because their evidence is unreliable. As a matter of fact there is reason to suppose it lasted even longer than your highest figure. But"—he dismissed the matter with a wave of the hand—"the difference is trivial, after all. For how long a time do you estimate the physical conditions on Marelli have been such that human life could have subsisted there?"

"O, I don't know about that. The physical conditions of a planet change slowly—very slowly."

"They do. A million years is a mere erro in the evolution of a planet. It would not be fantastic to say that physical conditions have been fit to support human life on Marelli for anywhere from 500,000,000 to 1,000,000,000 years. Even our history or tradition covers only the smallest fraction of that. But—suppose we take the modest estimate of 500,000,000 years as the time human life could have existed on Marelli. Compare with that the estimate of 1,000,000 years ago as the beginning of your glacial epoch, and of your estimate of the appearance of man on Marelli. You have accounted for man during only one five-hundred-millionth of the time he could have existed. What do you suppose was taking place during the other 499,000,000 years that conditions have been fit for human life?"

Harding grinned. "I am sure I do not know. A million years is as far back as my memory goes." As he said that the thought flashed through his mind that it was an idiotic thing to say to this wise old scientist, and reminded him of Billy Upton—dear old idiot!

"But let me tell you," the centenarian pressed unrelentingly, his old eyes snapping as he warmed to his theme, "when human life appeared on Marelli—or on any other planet: It appeared when conditions were fit for it. When conditions became fit for the primitive one-celled organism, that organism appeared; when they improved so that a primitive marine animal could exist in your waters, the animal came; when more elaborate life could subsist, it came; when conditions became hospitable for the very elaborate animal that is called man today, he came."

"That may well be," admitted Harding. "I know almost nothing about such things."

Old Mastono kept to his subject. His century and a half had left his mental tenacity unimpaired. "All right, Mr. Harding, but I have lived a long time, and I do know a little—only a little—of these things. I know that evolutionary conditions do not fit themselves to life: life fits itself to them. Life follows on the heel of condition. I know that the worlds were not made for Man, but that Man followed the course of change, and when his time had ripened, took his place as a casual and relatively insignificant link in the chain of evolution; and when unconsidering and relentless time makes conditions again inhospitable, he must be blown away again by a single breath of the Cosmos into the nothing from which he emerged. He must pass, even as the apes and the animals, the diamonds and the dust, the water and the air, the worlds themselves—not out of existence as *something*, but out of his identity as Man. But, as I was saying—it is not merely possible, but almost certain, that human beings have existed upon your Marelli for a half billion years, and maybe vastly longer. Life runs in cycles; but the cycles are so long and our lives are so short that we cannot observe their motion except with our intellects—our reason. It is like the movement of the distant stars. To our eyes they do not move. They are too far away. We cannot see their motion, though they move with great speed. It is as impossible for us to follow these vast cycles, as for an insect, born at the middle of the erro and dead before its close, to observe and analyze the course of a human life. It is almost certain, I say, that scores of these cycles—these periodic surges of humanity—have begun at the bottom, reared themselves to dizzy heights, and passed away, since your Marelli was fit for Man. There is not the least evidence or reason for saying they may not have reached unthinkable heights above us. Each cycle might have been a million years long, or five million, or ten million years long. But mankind has been before—billions of years, perhaps. Men as good as we, and probably better; civilizations as good as our best and probably better."

"Then why do we find no trace of them or their doings?"

"I can not say. Perhaps we do, though I think not. If we did we might not know it. In such vast cycles all things disappear. It may be that whatever ends, each cycle removes its tracks. The vastness of time has covered them so deeply or destroyed them so completely, that we cannot, or do not, find them. Things change continually. The only constant thing is change. Dust is cast into an ocean. It sinks to the bottom and becomes mud; it becomes rock; the rock is cast up and disintegrates into dust again, only to go through the like process again and again, it may be. Your own world is in no small part composed of other worlds which have drifted its way as dust and settled down to stay. Some day it will be torn apart and blown about the cosmos and go to make other worlds. Man is too small for these things, Mr. Harding. He is born on a puff of wind and perishes with it. No doubt Man will have billions of years yet on Marelli; but—he will be erased and have to revolve many times."

ALTARA raised up, suddenly. "And when man comes again, will he be man?" She was looking at Harding.

Harding shook his head with a laugh and a kiss. "I don't know, dear creature. Man thinks himself very great."

"O, of course," smiled Mastono, "and properly so, if he does not allow himself to be blinded by his own reflection; and so, doubtless, does the insect that is born, lives its life, and perishes while you sleep away an enna. But"—Mastono put the thought away with an impatient

wave of the hand—"Man is so small compared with his world, and his world is so small compared with its solar system, and its solar system is but a speck of dust compared with its universe, and there are myriads of universes."

"Yes, that is true," assented Harding. "I remember reading years back a good illustration of that. Some eminent astronomer figured out that if Marelli were represented by a drop of water and the universe were reduced to the same scale, they would make a mighty ocean. If she were the size of a grain of sand, the universes would make a vast desert. If the size of her orbit about the sun (nearly 600,000,000 miles) were represented by the point of a pencil, the nearest star would be over two hundred yards away."

"Yes," nodded Mastono thoughtfully, "that is very good."

"And he went on to say that if—some immense building—I've forgotten its name*—contained nothing but specks of dust—I think it was six—the specks of dust would be more crowded in the building than the stars in space."

"Ha! That is splendid, Mr. Harding! That is an excellent thing. I should like to remember the name of the man who said that. Can you tell me?"

"Why, yes. It was an English astronomer—England is one of our great countries on Marelli. His name is Jeans. He is still living, I think."

Mastono made a note of it. "Would there be any objection if I made use of that in some class work, Mr. Harding?"

Harding laughed. "I am sure Sir Jeans would be pleased to have his book quoted on Arelli. Only I am not quite sure that all of that came from Sir Jeans. The part about the specks did, though."

It was late into the enna when they ceased talking and Mastono said his old body was weary, what with the long journey and all. So they separated to sleep their last sleep in their underground homes. The next sleep would be under the black mantle of heaven, studded thickly with celestial jewels.

When they arose, they found the exodus of the people of the lower settlements begun. Hundreds had arrived and stacked their goods in the places designated, which were near the buildings they would occupy. Other hundreds were arriving. As each level was evacuated, it would be sealed off—perhaps forever—except for closed doors by which laborers might enter. There must be no more passing of the beasts. This would not interfere with the through tunnels to other craters, which ran near the surface.

Thousands of laborers had toiled during the enna getting the foundations ready; and as the erro came on, the crews of builders were at work on the superstructures, which went up as if by magic. While the houses appeared a little flimsy to Harding, accustomed to steel and concrete, they were astonishingly sound and fit for conditions at Copernicus.

The foundations were made by the rapid and simple process of fusing the surface soil into a solid mass to a sufficient depth for a stable footing. The house was erected almost as simply. First, slabs of polished stone eight or nine feet high, a few inches thick, and a few feet wide, were set on edge on the foundation and fused to it; then other slabs were laid across them and fused in place. The openings were cut neatly and smoothly by a disintegrating torch, and the glass of the windows set in; then the doors, and the people moved in and began settling themselves into the marvelous new life of the surface. The dwellings were small at the start, but were so planned that they could be made larger and another story or stories added when there was more time. There was no rain to guard against; no cold or heat. The power ceiling miles overhead, that kept the air in the crater, automatically kept the temperature at the desired point. The climate would always be the same, except when altered as desired.

It suddenly came to Harding, as he watched the miles of homes shooting up, that here was the setting for such a paradise as he had never reached in his fondest dreams. In his mind's eye he pictured the rows and rows of homes rising along the broad talus of the cliffs—150 miles in circuit these cliffs were—circling Lake Altara, with plenty of space between, with gardens and flowers.

As for the beasts, it looked to Harding as if they were checkmated, which only showed how little he knew of the matter, for within a single erro's time word came from the surrounding craters of (to adhere to the Earth names as far as possible) Stadius, Eratosthenes, Kepler, Ptolemy, Aristarchus, and the Hyginus Valley, that there were signs of the arising of the beasts.

From the fact that this account adheres in large portion to the crater Copernicus, because the main actors have dwelt there, it will not be supposed that Copernicus was in any respect unique, save as being the capital and residence of the King, and in some measure, because the surface works had made greater progress there. The inhabitants of hundreds of other craters, both on the hemisphere visible to Earth, and on that which is always invisible, lived in almost exactly the same manner.

The sub-Arellian settlements of each crater (save Copernicus, which was under the direct rule of the King) were under the local control of the King's governors, who were selected from the local population, according to the people's wishes. These governors ruled as they pleased, but subject to a strict accounting of their stewardship to the King.

Nor was the knowledge of the sub-surface beasts confined to the capital. They were supposed to exist beneath all of the craters—in fact more or less throughout the interior of Arelli. They had been heard in the lowest strata of several of the craters. It only chanced that circumstances had brought about their first actual depredations at Copernicus.

Neither were the preparations for surface living limited to Copernicus. It was a wide-flung policy of the King who occupied the throne at the time.

The King had caused warning against the beasts to be sent out to all governors, with complete details from time to time of the action taken and proposed against them. So that the governors were not taken completely by surprise, even though it had been supposed that the escape of the beasts at Copernicus had been the fault of the abandoned well being left open, and other outbreaks had not been expected elsewhere.

THIS raised other questions. *Had* the matter of the well been responsible? Or had it merely assisted the beasts in the particular case? In either event, how had they escaped in the other craters? It was incredible that they passed from crater to crater by the highway tunnels. Evidently the matter required further looking into, if Arelli was to prevent its people being smothered out of being beneath the slimy, crawling horde.

Harding had been waiting impatiently for Mastono to announce what it was that he had gone to his old home at Ylisae to bring. The next time they talked together, the centenarian opened the subject.

"When I was young," said Mastono, "I had some part in reorganizing the records. That was at the old capital, Ylisae, where I have lived a large part of my life.

*Waterloo Railroad Station in London.

During that work I found a strange thing. It was our custom to test each record after we re-installed it, to make sure it was in order. Our records are contained, as I think you already know, Mr. Harding, in the molecular structure of minute wires or tapes of prepared metal, uniform in size and composition."

Harding nodded. "Yes."

"Well, the test showed the wires of one cabinet to be blank—or, at least, they refused to produce anything when subjected to the ordinary tests. That might have meant merely that the particular tape had not been used, and had been placed among the others by accident. But my assistant, who discovered it, was a very intelligent fellow, and instead of casting it aside, he made some experiments on it to see if he could not bring out what had been recorded on it, if anything. In this he did not succeed. The record could not be persuaded to reproduce any flashes of sight or any sounds. Even he might then justifiably have discarded it, and probably would have done so, had he not seen that the cabinet in which it was housed was of a different make from the others, or any he had ever seen.

"So he set it aside for the time, and later brought it to me. The peculiar appearance of the cabinet was perhaps all that restrained me from throwing it away at once. It was easy to see that it was of very ancient make. But when I examined it carefully, I saw it was really unique and concluded it was worth investigating further, though I cannot say, even now, that I had much to go on. At any rate, I put it by, and being busy with many other matters, left it for years. Finally something drew my attention to it again, and I set to work on it. At last I found its secret and succeeded in reproducing what it contained. It had been recorded by a somewhat different process.

"The contents I found astonishing, and that is what I have just been to Ylisae to fetch." He sat silent for a few minutes, gazing out the windows across Lake Altara and the cultivated region around it, to "Atti Rettor," and the other mountain cones beyond. It was plain that the novelty and wonder of the surface living was still on him. After a while he rose from his revery and went to a table on which stood the ancient metal cabinet. He put his hand on it as fondly as if it had been a favorite child. "You see this little cabinet, Mr. Harding? It is of a kind that is known no more on Arelli." He made an electric connection, passing the current through a small mechanism which he put on the table beside the ancient cabinet.

"You see the lettering on the outside? It is so ancient that all our efforts have failed so far to decipher it completely, though we have made out some of it. The characters have changed. But we have been more fortunate with the words which the record reproduces. It, too, is so old as to be greatly changed, but we have been able to translate the greater part of it, though not quite all. Its age I do not know, though it must have been originally dictated a very long time ago, and deals with a period much more remote. It is some sort of review or digest of previous records, which are still existent and may be a milllion years old. I cannot say yet. I wish to speak of them, also."

Harding sat up straight in astonishment. "Why that seems impossible, my friend. Can a thing of metal endure half a million years?"

Mastono shook his head. "I do not know. Possibly. But I said 'originally dictated.' The records may have been renewed by the simple process of either re-dictating the contents or having them re-dictate their own contents on other records. The tape itself shows that. Perhaps it may have been renewed several times. I do not know about that. At any rate, the voice you will hear is not the original one. Though itself very old, it is a long way removed from the original one. I do not know how long the old records lasted. Our own present records, which are over 200,000 years old, have never been renewed so far as I know, though they may have been. Two hundred thousand years is a long time. If they have not been, they will be at some time, or a digest of their important parts, when they begin to fail, if they ever do. In that way there is no reason why history could not be preserved for millions of years—perhaps forever"—he looked up apologetically, adding, "whatever the word 'forever' may mean."

WITHOUT further ado, he flicked a switch and the voice in the cabinet began to speak in what to Harding, in spite of his growing mastery of Arellian, was an unfamiliar tongue. After letting it run for a while, Mastono shut it off, and took from a drawer a sheaf of sheets containing writing and drawings. He explained that these had been made at his direction from the instructions that were contained in the ancient record. He selected one drawing larger than the others, and spread it out before them. It was a geographical chart or map of a section of country, and the several crater-like formations said that the country was on Arelli. Plainly, it was the dry bed of an ancient ocean enclosed within a frame of mountains on three sides. Harding was too good a selenographer not to recognize it at a glance.

"The Lal Estoti," he said. "We call it the Mare Imbrium, or Sea of Showers. Not far from Copernicus."

Mastono nodded briefly and selected a written sheet. "Draw a line," he read, "from the center of Plato to the center of Copernicus."

Harding followed the line on the plate across the Sea of Showers, near the middle, and Mastono continued to read.

"Draw a line from the center of Aristillus to the center of Aristarchus. Where the lines come together is a very deep part of the Lal Estot, which still contains some water when this record is made. From the middle of this water two mountain peaks rise. Draw a line due north of the summit of the higher peak about nine lenni, to the foot of the cliff. Pass north on a level into the cliff and enter a natural cavern. Buried under a great crystal pillar are the ancient historical records of the people who have dwelt on the surface of Arrall (Arelli), and who are leaving the surface forever to dwell below the ground. The records we cannot take with us. Perhaps some day some one will return for them. They speak both of Arrall and Massall (Marelli), for many iltellos."

Mastono replaced the sheets and sat down, and Harding walked to and fro. There was a long silence, broken by Mastono.

"My friend, nobody knows how long ago it was that the people of Arelli left the surface. The dates given in these records do not help us, because they do not connect with our own, and we do not know what time they date from. It may be half a million years, or much longer. These buried records which are spoken of in this old cabinet may run back a million, or several million years—the originals of them. If the surface people preserved their records by reproducing them from time to time, we cannot tell how many million years they may cover. They could be preserved in that manner as I have said." He pointed a finger at Harding. "And you of Marelli are as much concerned as we, for evidently your history is there as well as our own. You remember I told you that formerly our people had the ability to observe in detail the happenings on Marelli."

"Yes, friend Mastono, that is true. We must get those records. As soon as the ships return from Marelli,

we will take the *Terraluna* and go to the place where they are. We will get them. Larry is going to bring the old *Terraluna* back, and also bring the new ship, which we have agreed to christen the *Altarasanna*. The *Altarasanna* is finished and ready now except for certain instruments which Larry has been promised very soon. Larry has a man who will pilot the *Terraluna* while he navigates the *Altarasanna*."

Mastono's face was wistful. "I should like to see those records before I die, Mr. Harding. I am getting old."

Harding gave his hand to the centenarian. "You shall, my friend. I promise them to you. We will go as soon as we can after the ships arrive."

Tears of joy and gratitude sprang into the eyes of Mastono at the rebirth of a hope that had been all but lost, and he turned away to hide them—turned away to look through the windows across Lake Altara, then to raise his eyes to the myriads of stars always shining in the black firmament of Arelli.

THUS the Princess found them as she came in from the receptions she had to attend. Her face was graver than Harding had ever seen it, but she smiled at them and went to lie a while in the arms of her husband before speaking of anything.

"My dear one," she said, at last, "do you think Larry and Sanna had better come to Arelli now, when there is such danger? The beasts are breaking out all over Arelli, and no one can say how they are doing it or what the end will be. Many hundreds of our people have been killed in a score of craters. Do you think we should let them come now?"

"Why, of course, sweetheart. The beasts are not going to harm us. They will be killed or driven back below. Of course the people from Marelli must come. There will be Larry and Sanna, Billy and Mercedes, Professor Merriam, and several others, perhaps. They will help us against the beasts. Merriam is studying the matter even now. And then, at the worst I should want the ships here, if it became necessary to take you and dad and Mastono here, and a few others away."

Altara shook her head. "That could never be, my dear one. My father would not leave his people to perish, nor would I. I am the Princess of Arelli, dear one."

They put such thoughts aside as far as they could, and went out to see the work of building. It seemed as if magic were being wrought. Row upon row of the dwellings were already growing with mushroom speed, from the line of the cultivated area of the "increasing green spot," back almost to the edge of the sheer cliffs of the crater side. Thousands were already occupied, and teeming caravans of people and goods were arriving by erro and enna.

Several of the lowest levels had already been emptied of their inhabitants and closed, and every level from the lowest to the highest was now closed against the passage of the beasts. It was felt that they could not have reached the higher levels, and that these would now be safe for living, as well as for producing the food without which all would be lost. And it did seem, as the erros came and went, that the instant and vigorous action of the King had saved the greater part of Copernicus from the beasts. Not a sign of them had appeared above the level of the aquatic park where the disaster had occurred. If they could be kept below this level, there would be room in the caverns and settlements, and along the tunnel-ways for many refugees if they came, and the food could be raised to feed them by extending the gardens and applying forced growth. A crop could be planted and brought to edibility in a few erros. Possibly even the lower levels could be utilized in an emergency, by establishing enough defenses. Each of the settlements of any level could be shut off from all the others by closing the tunnels, and as the surface buildings progressed and men could be spared, this work was put under way.

It was the King's idea that Copernicus must be made and kept safe as a refuge for the people in case it came to leaving their homes in the other craters. As yet there had been no influx from the other parts of Arelli.

On account of conditions it was thought wise to keep secret the arrival of the ships from Marelli, as the gathering of crowds was deemed undesirable. So it came about at the beginning of an erro that the *Terraluna* settled down into the crater as quietly as any vessel dropping anchor in its home port from a casual voyage. Shortly the *Altarasanna* lay by its smaller mate.

Dannie Marston and Gaston Perot, two of Larry's assistants at Altara Mountain, had brought over the *Terraluna*, while the others had occupied the *Altarasanna*. The former were tall, lean chaps of keen eyes and ready smiles and wit, with "capability" looking out from their eyes.

There was more kissing than had been seen on Arelli for a hundred iltellos. Mercedes, when she could spare her arms from Altara, ran to Harding, and then released herself to fly to the King in her own inimitable way and give him enough kisses to keep him in tasting for many erros and ennas; the royal Princess of Arelli kissed Larry and shamelessly bent down to embrace Professor Merriam; Billy Upton kissed the Princess until Mercedes vowed she was ashamed of him; Larry and the King joined hands, when they could come at each other, in a grip that bruised the flesh and bent the bones.

Dannie Marston and Gaston Perot were at last generously introduced by Larry as the men chiefly responsible for the prompt and efficient creation of the *Altarasanna*. Both were airmen to the finger-tips.

At last two old men stood near each other. Merriam offered his hand. "You are Mastono, I know. I greet you, my old friend." The grip was a warm one, even if it had perhaps not the muscular power of the younger ones. "Merriam, my friend," said the centenarian, "you are thrice welcome to Arelli. There are a hundred things I am waiting to ask you—nay, a thousand, I think." They drew a little aside. "Now how is it that"—etc. etc.

Others came up to greet and welcome the newcomers. It may be that the petite Sanna strutted her pretty little body a bit importantly on the score of having become an interplanetarian traveler and citizen. It may be that Irish Larry gave himself an air or two of justifiable pride over the new ship, and his accomplishments in respect thereto. It is certain the newcomers stood dumfounded at the vast surface settlement that had grown up in Copernicus. Some remembered seeing Altara go to Mercedes impulsively and say: "O, Mercedes, how I love you!" And hearing the warm-hearted Spanish girl reply, "O, Altara, you beautiful golden creature! I wish I were a blonde!" Which latter it is doubtful if the Princess comprehended by more than the half.

Harding's soul was delighted by the old affectionate appellations of olhorse, olcheese, olbean, and many others too long, for it is almost certain that his remark, "Billy you damn old idiot," should be so interpreted. Fortunately Sanna's command of the language acquired from her earnest study at the Mountain was sufficient to restrain her from addressing His Majesty the King by any of the more cordially ambiguous titles which she had heard fall so gracefully from the lips of Billy Upton.

BY and by they were all seated at a big table in the King's own surface house, and some were partaking of their first meal on another than their home planet.

The royal dwelling had need to be large, seeing the number of people of one sort and another it must house. It was by no means complete as yet—only enough of it for temporary purposes. The King would not permit the attention of the workmen to be given to anything like luxury for himself until the wants of his people had been fully served in the matter of surface homes. The telephone system of his underground quarters had, however, been connected directly to the new dwelling, so that messages might be received and sent without delay at any hour of the erro or enna. By the King's side at table stood a small box-like affair through which he received and sent messages without the necessity of moving from his place.

Hardly had the reunion meal begun when a message came through from the two craters of Esoh and Evas, to the east. It was bad news, too. The King had advised the evacuation of these two unimportant craters, both of which were small, having a population of but a few thousand. No surface works had been inaugurated there because of their projected abandonment. The underground tunnel roadways were inadequate and incomplete, and in spite of repeated warnings of the necessity of being prepared in case of the appearance of the beasts, the matter of guards had been attended to only indifferently and half-heartedly. Such guards as had been stationed were as apt as not to be asleep at their posts.

This, it appeared, was about what had happened, for the word, that came to the King now, was that the beasts had appeared almost simultaneously in the two little craters, which were near together, swarming over and smothering out the whole populations with the exception of a bare remnant that was fleeing through the tunnels to the nearest crater, Grimaldi.

Little could be done. The King instructed Tullos, the Captain of the Guards, whom he kept at his side constantly, to get Grimaldi and issue a warning that if the tunnel leading eastward had not already been closed, it should be done at once, only making provision for the passage of the panic-stricken refugees from Evas and Esoh. It was learned later that the beasts had overtaken the fleeing survivors in the tunnels and destroyed them all.

The vast crater of Grimaldi and near-by Riccioli, a thousand miles to the east of Copernicus, Kepler but a short distance east of Copernicus, Eratosthenes to the north, the Hyginus Valley to the west, and Ptolemy and Herschel to the south—all these and other neighbors of Copernicus, and therefore under the more intimate oversight of the King, had taken every possible means of defense. While all of these had joined enthusiastically in the King's plans for return to surface living, Kepler and Erathosthenes in particular, were fully abreast of the capital itself. Kepler, under the able governorship of a brother of King Altona, had had but a slight outbreak of the beasts, which had been promptly and effectually crushed. The surface dwellings were even in advance of the capital.

On the other side of the picture, Plato, near the north pole, Anristarchus to the southeast of Plato, Aristillus and Linné in the Sea of Serenity, Proclus and Atlas, in the northwest—all were fighting for their very lives, desperately trying to hold the scourge in check while dispatching their women and children and aged through the tunnels to the safer places.

Tycho, at the south pole, fifty miles in diameter and 17,000 feet deep, was energetically and ably defended, while Bailly in the Doerfel Mountains, 180 miles long, Clavius 143 miles long, and the black hole of Blancanus, 24,000 feet deep—all were in distress.

And so the story went, all over Arelli. It seemed as if the issues were definitely joining for the life or death of Arelli; the question being pressed as to who should rule for the future—humans or ghastly beasts.

"How does it happen, sir," asked Larry across the table, "that the beasts break out in the craters only? Why don't they break out to the surface as well? I don't suppose they have any way of knowing what lies above them."

The King turned to answer Captain Tullos, who had come in and spoken quietly in his ear. The conversation was extended, and the faces of both were grave and drawn. But when Tullos had gone hurriedly out the King smiled fondly at Larry. "Why, my boy, I suppose they show themselves in the craters because in them the excavations have been carried to such depths as to be easier of access—however they get access. But they may also appear on the surface, too. We have no way of knowing, since we do not ourselves go upon the surface generally. If any have got through to the surface they have no doubt perished. I wish they were all there. As to how much the beasts know about the surface—how intelligent they may be—I can say nothing of that, except by surmise, and one man's surmise is as good as another's."

Professor Merriam had broken off something he had been saying to Mastono, to listen. "Yes, yes, of course, Your Majesty. Yes. But still, these—er—beasts have lived on the moon—er—on Arelli, for a great many thousand of years—a great many tens of thousands—and it may be—it may well be, that they have developed some sort of beastly intelligence, or even a low form of central control. Yes. It may even be that the various species of beasts have united under the dominion of overlords or rulers from among their higher intelligences."

All looked at Merriam as if trying to make out whether he were perpetrating a jest but the Professor shook his head gravely, as he continued.

"No, no, my friends. No. You think I am gone a little crazy, from the change of—of climate. But I assure you I am serious. No. Wherever human beings have existed there have been always subjects of stories or fables, concerning demons, or devils, or evil spirits. My friend Mastono here, has told me the same stories exist on Luna—er—Arelli. These demons always live in dens or terrible places under the ground; always they are said to be companions of the fire, or noxious fumes and vapors; always they live in darkness or a phosphorescent light; always they are variously and unpleasantly shaped. There is never a tradition or superstition that is not based on something real—some element, at least, of truth. Which makes me think the like of this trouble has been experienced before."

It was Billy Upton who broke the brief silence ensuing. He threw up his hands in mock protest. "My dear old ch—er—old friend and savant, how you do harrow our feelings. You have made me swallow a—a—whatever you call these things—whole and I think it is about to choke me. And I distinctly heard her Royal Highness——"

"Billy, don't be an ass!"—Harding.

"But Freddie, my dear old overripe tomato! Why terrify the ladies? Tough nuts like you and me and the Professor—all O. K., of course. It's a pleasure to us. Nothing could frighten us—er—worse than we are already, but——"

"Billy, do hush!" It was Mercedes, and a soft hand cut off whatever remained of Upton's remarks. "Papa Merriam, do go on with your perfectly abstruse remarks. Billy is very rude, as I may have said before,

and when I get him alone—do go on, daddy Merriam."

Upton subsided. "All right, little peach blossom, I'm done. As nothing but a husband, I submit."

"Hush, Billy." But she kissed him, and something about the proceeding made Altara, only half comprehending the verbal passages, lean over and kiss her husband, too.

"Yes, yes, my dear Mercedes," said Merriam. "You are right—er—that is, I mean, Billy is right, although I may say, you are also...."

"Sure, Professor, an' we're all of us all right. Sometimes I even think I'm right meself—at the same time askin' the pardon of the little colleen here."

THEY all laughed at Larry's words, and the meal finished in lightness and jollity, even though stark tragedy stalked on Arelli. But it is always so. Man has laughed in the intervals between the turns of the rack of flashes of fiendish agony. Man has laughed with the fire eating his flesh away, and in the face of death itself. They laughed, though they did not know at what hour they should all be overwhelmed by the demon hordes from below. It is Nature's wise provision that her children shall laugh.

Merriam and Mastono went off to continue some argument. The three young girls went over to the old underground royal quarters, where Altara and Sanna wanted to show many things to Mercedes, and perchance, for all a man can know, to speak among their woman selves of certain toward events.

The King and Larry, Harding and Billy Upton, remained to talk together, and the three latter to smoke—a habit the King half wished, half feared to form. Indeed he had tried a cigarette once in strict confidence, but in his awkwardness had lodged a piece of tobacco in the wrong place and coughed half the enna before he could dislodge it.

We cannot resist the temptation, here, to let the reader listen but a moment to the learned discourses of the centenarian and the professor—just a moment, before readjusting the dials to the wave length of the royal party. It is the learned Merriam speaking—Merriam, A.B., A.C., A.D., and all the rest of the alphabet.

"No, no! Don't swallow it, my friend! Watch me a moment. See? It is very simple. It is really a most delightful practice. It soothes the nerves. It assists in concentration and contemplation. It—now try again, my friend. You will get it in a moment. Go easy at first. Just draw the smoke into your mouth and blow it out again. That's it! That's it! Splendid. Yes, yes. You'll learn. Just keep trying. Yes."

Picking up the genial Billy in the middle of a sentence—"same time, I just speak of it, though Professor Merriam won't thank me to steal his thunder and lightning. If he roars about it, Freddie, olhorse, you might just say Mercedes gave it away. He's afraid of Mercedes."

Harding was serious at once. "That's the first real idea I've heard yet, dad. Billy's so darn modest that when he has an idea he tries to palm it off on somebody else. Do all your pumping from the reservoirs on the abandoned levels and dry them up, and it may stop these beasts from multiplying in the water. As far as we can be sure, they haven't escaped except through the open hole, and there can't be many of them loose below us here."

The King nodded. "I will do that at once."

Upton went on. "Then concentrate heavy forces with heat guns, or whatever you call your local Gatlings here, and drive them back gradually and seal off every foot of space you can gain."

"Yes, that's being done, Billy," said the King.

"All right, then, keep it up till we reach the bottom, and we're bound to find out eventually whether they're still coming through from below, and if so, where, and to stop them."

And so it went on for hours, suggestions one after another being made, considered, and adopted, modified, or discarded. At last Harding spoke of the wish of Mastono to visit the cavern of the ancient records, and his promise to take one of the ships and help try to uncover them.

"No reason why you should not go, Freddie, my son," assented the King. "There is nothing you can do here any more than is being done."

"But have you thought of how you are going to land and excavate into that cliff, old bean? You know the air and the climate and things on the surface here aren't just regular."

"Yes, that's all fixed, Billy. Dad is going to let us have some of the suits worn by the workmen when they had to go up to the surface in installing the power ceiling and things. No trouble about that, I think. The people can go on the surface if they want to, the only reason they don't being that they have no occasion to."

And so it was arranged to start soon on the pleasant but none the less hazardous adventure of the search for the ancient records. The party was to consist of Mastono and Merriam, Harding, Upton, and Larry. The Princess declared for remaining behind, and Mercedes decided to stay with her. Sanna was more difficult. There might be danger, she said, and she would go watch over Larry. But the two girls at last won her to remain, which was more than a man could have done, and it was a relief to the men of the expedition. But this was only conditioned on the adventurers keeping in constant touch with home by radio and television. Marston and Perot elected to remain with the *Terraluna*, which had become as near to them as their meat and drink.

The *Altarasanna* was carefully equipped. Instruments for determining the position of the peaks in the Lal Estoti were a part of her ordinary fittings. Surface suits for all were got out and carefully gone over. Every available sort of weapon was provided. The beasts were abroad, and nobody knew what they might have to meet before they got back. Tools for the excavation into the record cavern, lamps for lighting the cavern, a surface car for the removal of the records to the ship, with tackle for hoisting them should they prove of great weight, and many other things were provided.

The trip was but a few hundred miles, and could easily be made in a couple of hours. How long their labors would require was a matter of conjecture. The King found opportunity in the absence of the women to caution them gravely to be on their guard in the matter of the beasts, particularly upon entering the ancient cavern. This warning, however, was hardly needed, as it was difficult for anyone to forget for so much as an hour the menace that hung heavy over all alike on Arelli.

Mastono, despite his 160-odd years, was as eagerly excited as a child, at the prospect of sailing over the surface of the planet. It would be a feat that he would be the first living member of his race to accomplish, certainly the first for untold thousands of years—except for little Sanna. He vowed aside to Merriam, that it was well worth living a century and a half for the great adventure. All in all, he became so excited that he choked on the new and delightful habit of smoking which Merriam had taught him with such pains. As the moorings were about to be cast free, the King remembered to caution them gravely for the third time to be careful in using the disintegrating torches on the airless surface, as a slight accident to a surface suit would mean instant death to the wearer.

¶ *"Run for the ship, quick."*

THE *Altarasanna* rose majestically until she was above the surrounding rim of Copernicus, above the power ceiling, out in the cold blackness of the ether, then with a reassuring signal to those looking up from below, they gathered speed and shot away toward the north and out of sight.

Sufficient elevation was made at once to raise the crater of Plato, inasmuch as a direct line between Plato and Copernicus was one of the determinators of the location of the ancient cavern of the records. It would then be necessary only to bear in the direct line until intersecting a straight line between Aristillus and Aristarchus, when they should be at their destination. To the men from Marelli it seemed as if it might be a well nigh impossible task to distinguish either Aristillus or Aristarchus from the multitudes of other craters which came within their view as they arose to a height. But old Mastono knew his craters. Every detail of both those that he sought was impressed indelibly upon his mind from the study of plats and other data, and without the use of any references he was able, by dint of puffing gravely on the pipe Merriam had given him, and the use of glasses, to locate both.

As the *Altarasanna* neared the intersection of the line between Aristillus and Aristarchus, she was brought down to a few hundred feet from the ground and her speed reduced to a mere crawl, while Mastono and Harding scrutinized the surface eagerly. Presently they found themselves over a deep, oblong valley with two peaks rising from the bottom. Directly ahead of them at a short distance the northern side of the valley ended in sheer cliffs. The record had said about nine lenni, which would equal something like a quarter of a mile and this they judged would be about the distance from the higher of the two peaks to the foot of the cliff. They knew they had reached the spot where the ancient cavern was located. Just at the shore of what had been a part of the Lal Estoti, and running up near to the cliff, was a gently sloping place that would do very well to land. This they did without incident, as near to the cliff as they could.

Before preparing to disembark (having had radio connection with Copernicus and received divers and sundry further warnings from the women) they examined the locality with care. There was no trace of anything alarming, and they had seen nothing of the sort on the way from Copernicus. If the beasts had braved or blundered upon the inhospitable surface of Arelli, it had not been thereabout, apparently.

But the cliff extended unbroken for miles and as no trace of any markings was visible on its face, it would first be necessary to run an accurate line north from the top of the taller peak. This would be the work of only a few minutes with a compass.

They looked over the surface suits again carefully. Their very lives depended upon these. A slight imperfection, permitting the cold to come in or the air to escape would mean instant death. Having assured themselves that all was well, and adjusted the tiny radio sets inside the headpieces to enable them to communicate with each other on the airless, and therefore non-sound-conducting surface, they put the suits on and let themselves out upon the ground. Larry and Upton carried the disintegrating torches with which they would bore their way into the cliff, and Merriam and Mastono carried lights, while Harding brought the compass and certain other instruments.

Harding proceeded to determine a line due north of the peak, while the others waited eagerly. The impatience of old Mastono mounted to fever pitch. His eyes shone brightly through the window of his headpiece, and he moved about nervously. Merriam was quieter, though undoubtedly almost as excited as the centenarian. The point of attack fixed, Larry poised a disintegrating torch at the place indicated and was about to turn it on. Harding had just cautioned him to have a care in its use, when Merriam raised a hand.

"Just a moment, Larry, my boy." He turned to Mastono. "My friend, the directions which we are following were written very many thousands of years ago, were they not?"

Mastono nodded, impatient at the slightest delay. "Of course."

"Well, then—I had no thought of it until this very moment, but north a hundred thousand years ago, or two or three hundred thousand years ago——"

Mastono saw the point instantly. Evidently he had not thought of it either. He threw up a hand. "Ah! What a fool I am! Now I shall have to make some long and difficult calculations. Let us go back into the ship. We must—I do not even know if I can calculate where north would have been when the directions were written, because I do not know how long ago it was done. It may be two hundred thousand, or five hundred thousand years." He made a determined gesture. "But come—we must try."

While Merriam and Mastono were making their calculations, a report was again made to Copernicus, more cautions received, and then the three younger men went out again to make another careful examination of the cliff. Perhaps they could find some markings to show them where to start in. Perhaps the person who wrote the directions had not thought of the change in the points of the compass during the thousands of years that might ensue before the ancient cavern of the records would be sought; otherwise it did seem that a mark would have been made, even though the directions were silent about it.

But though they scrutinized every foot of the cliff, they found nothing, and returned to the ship to await the completion of the mathematical calculations, even though it was apparent these might bring no great certainty.

THEY found the two older men hallowed in smoke, hard at their figures, so after closing the airlocks of the ship, they put off their surface suits, sent another message to Copernicus, and sat down where they could look out toward the cliffs. Somewhere along that rocky face was the right place to excavate. But where? The passage of the eons had doubtless obliterated any outer marking that had been made to point out that place. It seemed incredible no such mark would have been set. They sat a while in silence. A vague stirring of an idea had been making itself felt in Larry's fertile brain, but he could not grasp it. It was one of those tantalizing subconscious impressions that men work at for days and weeks before it crystallizes. Sometimes it never does. Larry kept trying to coax it to the level of consciousness. He found his eyes returning to one certain place in the cliff's face, but why he could not say.

"Listen here, old dears," mused Billy Upton at length, "it may be there is something—or *was* something at the time those records were interred—about the external contour of that line of cliffs that they thought ought to give a clue to any searcher. Of course, it *may* be that they clean missed the fact that the north pole at that time might be the equator a few hundred thousand years later—but—it doesn't seem likely—not to me, it doesn't. It *may* be, too, that they set a plain mark of some kind, but that doesn't seem likely either. They valued those records next to their very insides, and they'd think that if they marked the spot too plainly—made access to it too easy—they might be found by someone who wouldn't appreciate the records and might just destroy them. They'd figure that if the searchers were the sort they'd

want to find them—scientific men, like you and me, Larry"—he cast a humorous glance at Harding—"like you and me, Larry, why—why they'd be smart enough to figure the thing out. But——"

Larry suddenly put up an arresting hand. "Wait, Billy—wait. I've been almost having an idea for quite a while. I pretty near got it then. Hold hard a second. Let me think. I believe you're right, Billy. Now let us three look at that cliff and choose the place where we'd start digging in if we wanted to put away the records. You both pick out your spot. I've picked mine."

Harding spoke for the first time. "Right there almost exactly opposite us, where the line of the cliff makes a little indent. That's the spot, I'd say. There'd be about ten or fifteen feet shorter dig to get inside. And you, Billy, old idiot?"

"We-el-ell, maybe, and maybe not. I've been trying to reconstruct this place as it was when this was all sea. The water covered those cliffs, covered those peaks back of us, covered the whole thing here. There was nothing but water in sight. There was a natural open cave over there in those cliffs, filled with water. As the water went down so the cliffs were uncovered, the water would keep washing that cave deeper into the cliff, just as we often see on our coast lines. That's the way things probably stood when those records were cached there. If it hadn't been open, they wouldn't have known the cavern was there. So they put the records away, and came out and looked the place over, and one cautious old chap said, 'Fellers, these here records are doggone important things. I think we better close up that place there, so somebody or something, animals, maybe—can't get in and raise the very dickens with our babies in there.' Remember there was still air here then. So——"

"How do *you* know there was air? They might have had suits on like these." He indicated the surface suits lying where they had discarded them.

"Think again, Larry, olhorse. There was air here—quite a little sprinkling of it. Take that from an authority on whatever's the matter with you. There was air, because if there hadn't been there wouldn't have been water. The directions say there was still water in this basin where the peaks are. So, as I was about to say, this cautious chap, who reminds me of myself in some respects, thought they'd better shut up the entrance, which they did, I haven't a doubt. And how would they shut it up? They wouldn't need to close it up with masonry necessarily. They'd only have to put in a charge of whatever dynamite or T. N. T. they had handiest and blow it up. They'd probably do that right at the entrance into the cliff. So all you have to do is to find a place that looks as if an explosion might have taken place, and—there you are, gentlemen, just walk right in and help yourselves. There will have been little, if any change, in the cliff from the way they left it, because there have been no storms or changes in temperature since."

After a silence Billy concluded: "Therefore, I vote against you fellows and in favor of myself. That little indent you are so fond of, Freddie, my child, is solid rock like the rest of the cliff. The place where the explosion took place wouldn't be solid rock. There'd probably be a talus reaching well up the cliff."

"Billy," said Harding with a quizzical grin, "you aren't so dumb, are you?"

"O, no."

In a moment the three had put on their outside suits again, let themselves out through the airlock, and began re-examining the cliffs. A hundred feet eastward farther along the cliff than they had searched before, they found a talus extending nearly to the top of the rocky rim.

"I vote for this," said Upton.

"And I," echoed Harding.

"Unanimous," announced Larry. "Let's go back and give the old boys a chance to finish their figures, and when they get through, we'll get our little guns out and show them where to shoot."

"We have demonstrated mathematically," Mastono told them, "that the direction that was north at the time the records were buried would be some distance east of what is now north. Just how far east we cannot say with certainty by reason of the doubt as to the date; but it would be some distance east."

THE three younger men looked at Mastono admiringly. "You are right, gentlemen," grinned Harding. "Quite right. We have done some figuring ourselves. Amongst us three and you two I think we have the place."

Cautiously, standing well back, they trained two disintegrating torches on the cliff at the point determined on, and the débris of the talus melted as if it had been butter and disappeared. Soon they had uncovered what gave every appearance of having once been an underground entrance. Fifty or sixty feet in, the torches swept away the last barrier, and the cavern yawned before their eyes. Mastono would have rushed headlong in at once, but Harding restrained him.

"Wait, my friend. Remember the beasts. The cavern may well be full of them. I suggest we all go back near the ship and wait. These beasts probably don't need much air, and they might come rushing out. Eventually the cold would get them, of course, but that might be after they'd got us."

Harding broke off with a sharp hissing intake of breath as confused sounds came issuing out of the cavern. "Back! Quick! Run for the ship!"

Without stopping to look back so much as once, they made a mad rush for the ship, never slacking until they were safely shut inside.

They had been not an instant too soon in quitting the mouth of the cavern, for the hell's brood that came boiling, squirming, and seething, snarling, hissing and croaking, out of the ancient place, was none such as a man would care to be in company with. As they debouched upon the ancient shore, they spread forward fanlike to a distance of several hundred feet, their forward motion slowing perceptibly, and their frightful bedlam diminishing, as they came on into the withering cold of the airless surface. Then their forward movement ceased altogether, their horrible din quieted, and they became an abominable mass of swirling, squirming, billowing obscenity, their demoniac voices protesting more and more weakly, until it was no more than a ghastly moaning hiss. For a while there was an occasional flip of a slimy tentacle, the painful raising and questing from hide to side of a serpent's head, or the rolling of some elephantine torso, as their bodies shriveled visibly.

At last there was no more movement or sound, and after gazing a while in frozen horror, the passengers of the *Altarasanna* prepared to proceed with the venture. They had a grisly task before them. No human being could have steeled his soul to so much as step into the outer fringe of the hideous collection, harmless as they had quite evidently now become; and to go past the scattering fringe up into the thickening mass which entirely choked the entrance, was a thing unthinkable. The mess must be cleared up before anything further could be done, and they prepared to go at it with their two disintegrating torches.

It was Professor Merriam who halted them. "Wait," he fairly screamed. "I beg of you to wait a moment! We must take pictures. They may be of inestimable

benefit in dealing with these things. And think of the interest of science. Wait, I beseech you, until I can get a camera." He was already on the way to the ship as he spoke, and in a few moments had returned with a camera, and had begun snapping picture after picture, the objects which appeared the most interesting. At last he was satisfied after he had taken half a hundred views, and permitted them to proceed. Mastono said that the pictures should be transferred to the permanent records and made a part of the future history regarding the beasts—if, indeed, there were any survivors on Arelli to make any more history.

As the disintegrators were turned upon them, the creatures disappeared into nothingness, only a slight cloud of vapor rising from where they had been, forced upward by the pressure of the torches. Slowly they cleared a wide pathway through, more and more slowly as they approached the entrance. It required some time to clear out the entrance, and when it had been done, and they began to penetrate into the cavern itself, the work was still a herculean one. It seemed as if the ancient cavern must have been filled full with the things. But at last they were through to the free space of the rock floor, and put their torches aside. Even then Harding counseled extreme caution in proceeding forward.

"Keep together in a bunch," he warned them, "and don't rush ahead. Let's stand here and look around first. There is no telling what may still be inside here. There may be a passage leading down below, and nobody knows what might be coming up yet."

"Yes, yes. You are right, Freddie, my boy. Yes. In fact I had been thinking of that myself. The cavern must have been warmed to some extent from some source, otherwise the creatures could not have existed in here any more than they could outside. Yes. They would have frozen solid half a million years ago. I suggest we endeavor first to find out about this passage by which they came up from their dens proper, which must lie far below here."

"I suggest, however," put in Billy Upton thoughtfully, "that if they mean to come up and see us they'd better be humping it, or they'll be too late. However it may have been before we opened it up, I fancy this hole in the ground is now as cold as it is outside, which wasn't good for their health. So I hardly think there is anything more to fear from them. Whatever passageway they may have had to their home town is apt to be about 5,000 below zero by this time."

This seemed likely, and they ventured forward, taking the precaution, however, to lug their disintegrating torches along in case of unexpected stray visitors who might be more hardy than their brethren.

The cavern was a large one. All that the directions had said was that the records were "buried under a great crystal pillar." The pillar might be in any part of the cavern. Therefore, after looking about a little more, nothing appearing to threaten them, it was decided to separate into two companies. Mastono and Harding went one way, holding the light and Harding carrying one of the disintegrating torches; and Merriam, Larry, and Billy Upton went the other way, Upton and Merriam carrying lights and Larry carrying the other torch. Thus they made the complete circuit of the cavern's edge, examining it as far as their lights extended toward the center, and met on the other side, without finding any trace of the crystal pillar. Mastono's face was a picture of disappointment, and his eagerness had slowed to a certain nervous tension. Probably no one else in the company realized what it meant to him to find the records—unless it might be Merriam.

"We'll turn around, now," said Merriam, "and go back through the center. It may be that the crystal pillar is in the center."

AND so it was—almost at the exact center. The crystal pillar consisted of one enormous crystal fully six feet long, fixed on end in the rock floor. Undoubtedly the records had been found. Remained the task of unearthing them from their eon-long burial. This was a matter for care. If the disintegrating torches were turned straight down through the floor of the cavern, the records might be injured or destroyed. There was no telling in what manner they had been buried, nor what space their crypt might occupy; neither had they any way of estimating how deeply they lay beneath the floor. But the torches were the only means they possessed of excavating into the rock. Any other way might require many erros and ennas. They therefore selected a spot about ten feet each way from the pillar, and began two experimental holes. When these were down what they deemed a sufficient depth, without encountering anything, they began to work toward the center from them. They had not gone far when they encountered a solid metal wall on each side of the pillar. Again they paused to consult about the proper method of gaining entrance to the metal vault. Harding was for boring a hole through at a venture; but the old centenarian was childishly fearful that such a course might injure even the smallest atom of the precious contents of the vault.

At any rate, it was necessary to recharge the torches, which had grown noticeably weak, and advisable to look over their surface suits and refill their charges, and it was apparent there were other matters to be considered. Again it was the comical but really thoughtful Billy Upton, who had been thinking deeply.

"Since there was air on the surface when these records were buried," he remarked, with a malicious look in the direction of Larry, "there would possibly, even probably, have been air in the record vault—although I realize it may have been removed at the time or escaped since. If there was air in it, there may still be, and if so, the inner pressure might cause an explosion if we were to remove the rock from around the vault, particularly if the air inside became heated to any extent from the use of our torches. We might all be blown clear to—to Marelli, not to mention the records being ruined."

"That is true," allowed Harding. "What do you propose, Billy?"

"Why, I suggest punching a hole through the metal wall of the vault first. We could do that by placing a pointed bolt against the wall and a light charge of explosive to drive it through, with a fuse to give us time to get out of the cavern, just in case anything *should* happen." He glanced at Mastono. "Just a *light* charge, you understand, friend Mastono, which wouldn't hurt a fly inside, but would make a hole to let out any pressure that may be inside."

This seemed the best method available, and the execution of it brought no disastrous consequences, and they removed enough of the rock about the vault to permit enlarging the hole so a man could crawl through.

With instinctive delicacy they all drew back and glanced at Mastono. It was his world and his records, and his undoubted right of first entry. Merriam would be the next, since all worlds and all things are the stepchildren of the scientist.

The old Arellian eagerly, and with quite a little solemnity, thrust his head through the opening, then withdrew it quickly to put his light in first and his head second. Again there was the thought of caution. Who could say what might be inside a vault sealed for hundreds of thousands of years?"

"Better look it over well before you go in," warned Harding. "There might be snakes, or—almost anything, in there."

But after no more than a glance round the vault, Mastono crawled in, beckoning Merriam after him. The place was no more than ten or twelve feet square and as high. There were a few stone shelves around the walls, with a few small cabinets like the one containing the directions. That was all. At a glance it seemed a short and inadequate climax to their long and complicated hopes and preparations. The vast age of the place seemed in decency to demand a more pretentious realization. But there they were—the hundred or so rusty looking cabinets, quite unimposing for all their age and their expected miracles of content.

Well, the thing was accomplished, and there was nothing to do now but remove them. Nothing was to be gained by merely looking at their exterior. So Harding began to hand them out to Larry, who in turn passed them up to Upton to load on the small vehicle for transfer to the *Altarasanna*. They were not very heavy, save with age and dignity, weighing not more than probably twenty or thirty pounds apiece—as pounds would be figured on Marelli. Two loads took them.

With no more than brief backward glances, when all had been done, the ship was put in flight for Copernicus, where without incident it landed three lovers into the waiting arms of three anxious women, and two others into a fever of preparation for the translation of the precious voices of the distant past.

It also landed them into the very midst of a situation that every erro was becoming more dark and critical for the future of Arelli. The King had not been present to greet them on their return, interested as he undoubtedly was, and sure as he would otherwise have been to do so. Altara explained that he was occupied in conferences with a number of ambassadors from the various more important states, or craters, of Arelli. Insistent as any local governor might have been to run his own part of the state in his own way during normal times, all alike in troublous times demanded of their overlord the King instant and omniscient advice and assistance. They demanded what they themselves lacked, adequate wisdom to subdue and banish their menace; success where they had failed. They were inclined to thrust all responsibility upon the King's shoulders, with all blame for past and present failures, reserving unto themselves only whatever credit might be assumed to accrue that things were not worse.

The people of a large number of the small and backward outlying crater communities had been strangled out of existence. In some cases a few had made good their escape to more fortunate places; in some cases none. Many inhabitants of the larger craters were gradually being driven into a corner by the beasts. All were suffering more or less. Straggling groups of refugees had soon begun to center upon Kepler and Copernicus, where conditions were the best. These had represented the well-known type who always flee at even the distant whisperings of danger. These rivulets had been steadily broadening and deepening into a great human river, that threatened to overflow the capital.

There every man and woman who could by any means be spared from the work of food production was pressed into the building and equipping of the surface habitations. Of these dwellings thousands had been added to thousands, until the whole available space on the crater's floor was filled, from the edges of the central Altara Lake and the horticultural area to the very vertical line of the precipitous surrounding cliffs. The agricultural area must not be encroached on. There was no telling when food would be at a premium. Fully half of the sublunar levels of Copernicus had been vacated, and in such of these as were still safe the refugees were installed as fast as they arrived, and set to work at once producing their own food by the most intensive processes known. As the number of the refugees increased, there were not houses for them, above or below ground. They lived in the open places of the caverns and slept on the ground. This was no great hardship, however, as the temperature was warm and uniform.

KEPLER, ruled by the King's able brother, was the blue ribbon community of Arelli. It had been made absolutely clean of the terrors from top to bottom, and was apparently being kept so. Its normal population had been about 250,000—much smaller than that of the capital. Its surface dwellings had also filled the surface of the crater, and were themselves filled. Its vacated underground spaces were also crowded with refugees, until it was housing three times its usual 250,000. The nearly 400,000 normal population of the capital had become close to a million.

The mysterious Hyginus Valley, near Copernicus on the west, 95 miles long and only a mile and a half wide, and of unknown origin, was in excellent strategic shape for defense, was under capable governorship, and holding its own against the terrors. It, too, was crowded above and below the ground.

Riccioli, far to the east and near the vast Grimaldi, had become, through some circumstances that no one understood, the focus of such a savage attack, that it had had to be abandoned. Its surviving population had crowded into Grimaldi, along with that of other small abandoned craters still further eastward.

Everywhere the people of the smaller craters centered into the nearest large ones, until gradually there came to be a few great centers of population instead of many small ones.

At the old capital, Ylisae, the evil politician Uffuldo, father of the infamous son Ullo, who had made a nearly successful attempt to carry off Princess Altara, had been thoroughly set down and the place put under the rule of a committee of governors, on account of its central location. It was barely holding the beast hordes in check and was threatened with lack of food for its great and growing population.

Great Tycho, at the south pole, had followed the example of the old capital, and though crowded to overflowing, was doing fairly well. Bailly and Clavius, on account of their great size, had to be left to the beasts, and the people had to flee to Blancanus and Tycho; the former, having recovered from its earlier distress, had gradually pressed back the enemy.

Looking over the situation generally, it was hard for the King and his faithful Captain Tullos to say whether Arelli as a whole was gaining or losing its fight. Certain it was that though some of the larger craters were able to hold their now teeming populations fairly safe for the moment, hundreds of others had been completely overrun and abandoned. It seemed as if the beasts, like able generals, were cleaning up the fringes so that their flanks would not be harassed in the gigantic warfare to come against the coveted larger centers. What the result of that final warfare would be they could not yet determine. The thing that had finally become a fact was that Ylisae, Tycho and Blancanus in the south polar region, Grimaldi in the east, with Kepler, Copernicus, and the Hyginus Valley, supplemented in some measure by Ptolemy, Herschel and a few others, now held practically the whole surviving population of Arelli, which before had been distributed in a more or less scattering manner over sev-

eral hundreds of craters. Certain it was, also, that that population could not possibly be more than seventy-five per cent of what it had been just before the outbreak, and possibly not more than fifty per cent.

This was the situation at the time of the return of the *Altarasanna* from the salvaging of the ancient records. And then came a comparative lull in the struggle. In several places it was reported that the aggressions of the terrors had somewhat abated. But whether Arelli was really beating them as a whole, or whether it should be taken as a sort of grim warning of worse days to come—that was what no one could tell.

In such situation the provinces that were holding out had sent their ablest men to Copernicus for advice and counsel with each other and with the King. These were the conferences that the passengers of the *Altarasanna* had found in session on their return. As soon as the King knew of their return he sent to ask the four Tellurians and Mastono to come to the council chamber in the old royal quarters. Dannie Marston and Gaston Perot had gone somewhere below where Captain Tullos had been sent for on account of some critical phase of the unremitting struggle to clear the lower levels of the terrors. Mastono begged, on the ground of fatigue, that he and Merriam be excused from attending the council for a while, promising to come later; and he and Merriam went off together.

No time was taken to present the Tellurians to the individual ambassadors, of whom there were half a hundred assembled. The King merely called the visitors to him, shook their hands, and told the gathering who they were.

"Gentlemen," he said, putting a hand on Harding's shoulder, "this is my son, Prince Frederick Xerxes Harding, of Marelli, the chosen husband of Altara, Princess of Arelli. Prince Frederick is chiefly responsible for the renewal of communication between our planet and Marelli." He next put an arm around Larry's shoulders and smiled down at him fondly. "This is my very good friend, Larry, of Marelli, whose heart is as golden as that of Sanna of Arelli, with whom he is mated." Then he turned to Billy Upton and stood looking down at him with a quizzical smile. "This is Billy Upton, of Marelli, gentlemen, whose mind is as keen as his face is genial." His face suddenly turned grave again. "Let us go on with our work, gentlemen. We are fortunate to have these friends of Marelli with us. They have already been of great help. I am sure you will be glad to hear from them when they have recovered from the weariness of their journey into the Lal Estoti, where they have been with Mastono and the able Professor Merriam, also of Marelli. This journey, Prince Harding informs me, has resulted in the finding and bringing back to the capital the ancient records of our people, buried there for perhaps many iltellos. Mastono and Merriam are even now working at the translation of them and I suppose will not stop until it is done." He turned to Harding. "Freddie, my son, do you wish to say something now?"

Harding arose. "Gentlemen of Arelli, let me assure you of the cordial friendship of Marelli, and our sympathy in your troubles. All that we can, we will do to help you. I shall be glad to meet you all personally when there is time. You have work to do now, I know."

BILLY UPTON and Larry looked at each other. "After you, old toppie," smiled the former with a slight wave of the hand, and Larry arose with hesitation and spoke without greeting. "I am glad to say, statesmen of Arelli, that on our journey just ended we met a few hundred of the beasts when we entered the cavern to bring out the old records. They are dead, and we are alive, as you see, though it was not we who killed them. But we have learned something from the adventure, and I assure you they are not to subdue your beloved Arelli, but Arelli is to subdue them. I will not take your time now, as I see from Billy Upton's face that he is going to make a very long speech."

It is not known, but only surmised, why King Altona of Arelli smiled a peculiar smile, by no means free from pleasure, when the genial and sometimes flippant Billy Upton arose to speak to the grave and dignified ambassadors.

"It is but fair to my friends Prince Harding and Prince Larry to inform you," he began, "that they are both princes in their own home towns, or—anywhere you may chance to meet them, erro or enna, Copernicus or San Francisco. Some day you will go to Marelli and see, for look you, men of Arelli, the day is right at hand when you will eat your—er—mush and grapefruit on Arelli and your soup to nuts on Marelli. Great ships will flash you there in the space of an erro or an enna—*your* ships, they will be, and ours. The two worlds are already become one, for the two citizens who will arrive at Copernicus soon, will never be able to say whether they are the more of Arelli or Marelli. These will be the first heralds of a great interplanetarian citizenship to come, and in their names I pledge you everything Marelli has if you shall require it."

"Ah! My friend of Marelli!" cried an old ambassador, springing up and coming forward as Billy Upton paused, "those are good words. May I shake your hand after your custom of Marelli?" Upton gave the ambassador a firm and cordial clasp, and then gave the same to the King, who had arisen with tears in his eyes.

"Go on! Go on, Billy Upton!" cried another.

"Yes, Yes, we would hear more," said another.

Others were on their feet waving their arms.

"Thank you," went on Upton easily, "they *are* good words, and would be whoever might chance to say them, because they are *good words*. Now, about these beasts: I would not worry too much about them if I were you. They have taken many of our cities, and in doing so they have sealed their own doom." He paused a moment.

"We do not understand," said one.

"Just this: when these people fled from their homes, I don't suppose they stopped to shut their doors, do you?" The ambassadors looked at each other, puzzled. "No, I don't think they did. And about the first thing the beasts probably did after the people left was to go outdoors and take a breath of fresh air. Well, by that time the power ceilings were gone, I expect, through the stopping of the machinery, and—what do you think the brutes got then?"

There was a silence. Then "Ah!" breathed the old ambassador who had taken Upton's hand. "Ah! That is so!"

"My God!" (or the Arellian equivalent) said two others. "That is true, friends!"

The King was heard to draw his breath sharply as Upton continued. "Tomorrow a child could walk through every one of those abandoned craters and not a hair of his head be harmed—Riccioli, Bailly, Clavius, Evas, Esoh, and a hundred of the other outlying craters, are safe today. All you have to do is to send some—er—scavengers, to clean up the mess, and their people can return without fear. The people saved their homes in abandoning them, and unless I am more mistaken than I think I am, it won't be ten erros until their attacks will subside in all the other places, and there will never be such a thing as a beast seen or heard of on Arelli again."

The quick-thinking ambassadors had followed Upton

to the end, in spite of the fact that he had interlarded his remarks with an occasional English word when he did not know the Arellian synonym, and when he sat down there was an uproar as the ambassadors, casting dignity to the winds, clamored forward to greet this man who had so genially and yet so profoundly captured the situation.

The King fairly took Billy Upton into his arms, and Larry cried, "Bravo, Billy! Bravo! You're sure the something's something, or whatever the hell it is. Good old Billy!"

Harding proudly slapped his back. "Why, Billy, you damned old idiot! I never even thought of it! Certainly they're dead. Why, you—you damned old—old idiot!"

"Shut up, Freddie, olcheese, and let me outa here. I want to—to ask Mercedes something."

"Same here, kid," seconded Larry; and to the King, "Excuse us, will you, sir?"

The two dashed out, followed close, albeit more dignifiedly, by Prince Harding, who desired to say something to the Princess. The gathering quieted, and as soon as he could be heard, the same old ambassador who had greeted Upton was on his feet.

"Your Majesty, I have the honor to suggest that some fitting mark of our esteem be conferred on these most excellent men of Marelli, who have assisted us so greatly, and upon their mates. We have no way of honoring our beloved Princess Altara more highly than she is already honored, but I ask Your Majesty to bestow on these others the honorary titles of Princess and Princesses of Arelli, and to have appropriate entry made in the royal records."

The King nodded and smiled. "If there is no objection I will be glad to do so; and the honor will be extended, upon their arrival to the two expected joint citizens of Arelli and Marelli."

Amid hearty cheers for the expected interplanetarian citizens, there being no further business, the council decided to call it an erro.

On the morrow there was more business for the good ships *Altarasanna* and *Terraluna*. No less than flying to the abandoned craters with a passengering mingled of both worlds. They found it true as Billy Upton had so shrewdly guessed. In the panic, the airlocks had not been closed. The beasts had "gone outdoors to take a breath of fresh air." The neglected machinery had caused the protective power ceilings (where there had been any) to fall, and the beasts had met the same fate as at their exit from the cavern of the ancient records. There could be no doubt that the disaster to the beasts had extended to the lowest levels, for even where local tunnels were provided with means of sealing the levels apart, no one had stayed their panic-stricken flight to close them. Indeed, the very thing that had proved the salvation of Arelli might, except for the precautions in sealing of all tunnels from abandoned craters, have proven the death of all; for subsequent investigation proved that the through tunnels had lost their atmosphere right up to the points of sealing, and but for the seals there might have been no air left in all sub-Arelli. Beyond all doubt the failure to close the doors behind the fugitives had saved Arelli. It remained only to see if the extinction of the beasts had extended to their ancient underground dens. No exploration would be necessary. Events would prove shortly, as Upton had suggested, whether this was true. If the aggression of the terrors in the sealed lower levels of the inhabited craters ceased, it would mean that their underground dens were destroyed *in toto*. In this case they would need only to recharge any places from which the air had escaped, clear them of dead beasts, and Arelli might go ahead and rehabilitate herself free from all fear for the future iltellos.

UPON the return of the ships and confirmation of the good news, cars were at once equipped with airtight protection, manned with workers likewise protected, and sent out through the tunnels with disintegrating torches to remove all signs of the ghastly visitants from the hells of Arelli. Open tunnels were sealed and recharged with air, and the fugitives were soon on their way back to their homes.

It remained to see, however, whether the outrush of the air from the underground quarters of the beasts beneath the particular craters where they had been found dead would extend to all of their underground dens. If, as the general theory was, these dens were all interconnected throughout the interior of Arelli, then the air would rush out of them all, and the terrible cold rush in, and the beasts would be destroyed throughout all underground Arelli. If they were not so connected, then there might still remain battle to do beneath the places where the beasts had escaped destruction. It would require some time to determine this matter on account of various considerations. While thus awaiting the outcome, all precautions would have to be maintained.

Otherwise the activities of Arelli centering at the crater of Copernicus went on as usual, and it was inevitable that the interests of old Mastono and Professor Merriam should center largely in the translation of the ancient records. This they set about at once. In fact, as the King had strongly intimated he suspected, they had been already at work on them, when they had begged off from the meeting of the pan-Arellian council.

Mastono having already had experience in the matter of working out the translation of the contents of the old record cabinet of directions, they were fortunately in position to get into the midst of the matter without preliminaries. There was no difficulty in determining the order in which the records ran, since not only had they been stored in order in the ancient tavern, but they bore plain marks on the outside of the cabinets showing their order. This order was indicated by the years covered by each cabinet of records. The only trouble with this was that it was not known, nor did they have any way of determining, unless the records themselves should give them a clue, from what the chronology dated. This they hoped to establish in some way from the contents, which it turned out they were able to do within reasonable limits of error. A few thousand years in such vast periods of time did not matter much.

They first determined that the logical method would be to begin with the cabinet showing the latest dating, or that nearest their own era. This they did. The first cabinet was tenderly set up, the necessary attachments and connections made, and the two scientists having placed themselves expectantly in the most favorable positions for seeing and hearing, Mastono tripped the little switch that would set the mechanism in motion to reel off the slender tapes on which the records had been impressed hundreds of thousands of years before.

It will be understood that these records were exceedingly compact. A very small cabinet would hold miles of fine tape, and a mile of it might cover tens of thousands of years, as each slender length would contain a volume. There were found to be ninety-three of these cabinets, so it seemed only reasonable that the two scientists would have enough under any ordinary circumstances to occupy them for the next hundred years. But the circumstances were by no means ordinary. The two who had placed themselves at the herculanean task knew how to handle it, as will be seen.

Mastono, then, tripped the little switch; the mechanism started as if it had been doing the like every day; and without much preliminary scratching or complain-

The scenes that flashed before them made the scientists draw back with a gasp.

ing, a voice from the inconceivably remote past was speaking to them as plainly as if it were of the current day. The language was, of course, totally unfamiliar to Merriam, and not precisely familiar to Mastono, since language changes widely under the exigencies of a hundred thousand years. It was the realization of this that had caused the makers of Arellian records to supplement the text by continuous and copious illustrations, for pictures speak all languages alike.

It will be supposed that each of the men was interested the more intensely in the portion that dealt with his own planet. It would have been strange if such had not been the case. Every man who has a country loves it the best; and it seems likely that every man who has a planet, as most have, would always love it best, too, even though it consist of many nations. We suppose that a terrestrial American, or Englishman, or Chinese, would appeal to the heart of a terrestrial more

intimately than a Jovian, or Martian, or Arellian American, or Englishman, or Chinese, even though we have found Martians and Jovians and Arellians who wrap themselves about the human heart strings as intimately as another.

It would fall largely to the lot of Mastono, the centenarian, to interpret the textual and pictorial references to Arelli, while Merriam might be supposed to comprehend more readily those touching Marelli.

The opening sentences from the voice of the eons long gone was only partly intelligible even to Mastono; but its message was at once made plain when pictures began to flash in rapid succession upon the screen that had constituted a part of the preparation of the scientists. Clearly they were pictures taken on the surface of Arelli. When it was desired to scrutinize any particular scene, the pressure of a button stopped the passage of the tape, and held the scene stationary on the screen as long as they desired.

The date of the first picture was given as the year 842 of the 123rd miltesso from "the great transformation"—an unknown dating entirely, since they had no idea what the great transformation might mean. Mastono correctly surmised that the world "miltesso" was the ancient form of "Iltello," indicating a thousand years. So that the year would have been the 122,842nd year from the great transformation—whatever that might be. The first scene they at once recognized as the precise spot in the Lal Estoti where the records had been found. There still remained some water in the deep depression containing the mountain cone from which they had reckoned the location of the entrance to the ancient cavern. They were getting a start; and although still unable to connect up their chronology with any familiar calendar, they hoped by comparative study and calculation to do so before they were through.

Their plan was to skip swiftly this first time through the cabinets, to pick up the high lights, and go back later to those things they might wish to examine with care. To the following scenes of the first series they gave, therefore, only cursory attention. They depicted the last phases of the surface life on Arelli. There were forests and other vegetation, most of which gave evidence of gradual failing under the distress of unfavorable conditions, doubtless rapidly becoming worse. The ancient seas were bereft of their waters except in some of the deepest places. The people bore much the same appearance as themselves; clad differently, it is true, but much the same people, and still living in their surface cities, and in such agricultural areas as still remained cultivatable.

THEY passed quickly over the vocal comments, which Mastono could tell gave general announcement of the necessity of retirement from the general surface to the craters, and thence to underground dwellings, which were even then in preparation. In fact, some of the smaller urban centers of the surface had already been abandoned.

The record then passed on to detail in words and pictures the family and political life of Arelli, or Arrall, as it was then called, with brief accounts of the educational and scientific advancement of the period. The population of all Arrall was given as about half a billion souls. They were separated at that time into several independent nations, among which there seemed to have been the inevitable struggles for this, that, and the other. There was no mention of air travel, so far as they could understand the commentaries, and certainly nothing like airships appeared in any of the illustrations. They concluded that air travel had either been discontinued on account of the thinning of the atmosphere, or, what seemed more probable, the knowledge of it had been lost from some cause not apparent.

The second cabinet bore the same dating as the first, the year 122,842 from "the great transformation," and to "Merriam's inexpressible delight dealt with Marelli, then known as Massall. The very first scene put Merriam into a quiver of eager expectation. He recognized it as Europe of the Second Interglacial Epoch. Mastono pressed the button and let it stand steady on the screen.

"That is undoubtedly the country we now call 'Europe'," the little bald-headed scientist cooed. "And the time fits in well with the Arellian history we had in the first cabinet. The Second Interglacial Epoch on Marelli may be placed somewhere between 250,000 and 375,000 years ago. So you can put the retirement of your people from the surface, within rather broad limits of error, of course, at about that long ago, since the two cabinets bear the same dating. The people who made these records showed intelligence. They realized that there would be likely to be a great deal of trouble placing the events, and in order to assist they have placed under the same dating contemporaneous records of Arelli and Marelli, with the idea, no doubt, that one might help the other out.

"The rather primitive-looking people shown here are of what we have arbitrarily called the Heidelberg race. The name Heidelberg means nothing, friend Mastono, except that the first evidence of this race was a single jawbone, unearthed near a place called Heidelberg, in the country we call Germany. That's all there is to that. As a matter of fact there was some question whether the race was really a human race as we understand the word. That is borne out by the people appearing in this scene on the screen before us. They certainly have a look of considerable intelligence, but as you see the jaw is almost chinless—low forehead, retreating. Very likely their speech was primitive, if they had any at all. And yet the teeth shown by this jawbone I speak of were distinctly human teeth."

"In order to show so large an area," suggested Mastono, "this scene must have been taken in many parts and a composite made of them, then rephotographed for this record."

"Yes, yes," agreed Merriam, "I suppose so. Yes. I was wondering about that. But the composite agrees well with our own conceptions of the topography of Europe 250,000 or 300,000 years ago. What we call the Mediterranean Sea"—Merriam indicated the locality—"did not exist. There were only some large lakes, as you see here. In other words, during the glacial epoch so much of the waters were frozen that the seas were low everywhere. Then, when the glacial times passed, and the ice melted, it infringed on the land and narrowed the continents. Yes, yes. There were only some large lakes, as you see here, where the Mediterranean Sea now lies. Europe extended further to the westward. There were great inland waters where are now what we call the Black Sea and the Caspian Sea. This country at the north here is now separated from Europe and cut up into what we call the British Isles. Let's see what the next one has to say, friend Mastono."

Mastono pushed the button and let another scene show. Merriam examined it closely, puzzled at first.

"Why, that's—good heavens! That must be Asia, though different from our Asia of today. Yes, yes. And an obviously advanced and enlightened civilization there 300,000 years ago! Yes. Well, well! Buildings and cities and great ships on the seas. This will be a surprise to some of my brethren on Marelli. My stars, yes. No doubt it was some of these people who subsequently migrated into Europe later. Well, let's shoot along. We can come back to these."

"Where does this Heidelberg race stand with you,

friend Merriam? Where do you place it as related to your other early races?"

"Well, all the knowledge we have, practically, of the prehistoric peoples is limited to Europe. For example, this advanced civilization we just saw in Asia is entirely new to me. In Europe we have, beginning with the most recent and going back—we have the Cro-Magnon race, an intelligent race, with as full mental potentialities as we ourselves, but without much application of it as yet; living out of doors in the shelter of natural caves. Place that, very roughly, at 25,000 to 40,000 years ago. Then the next we know anything much about is the Neanderthal race, also in Europe, you understand. Call that 50,000 to 75,000 years ago. Then comes the pre-Neanderthaloid and Piltdown folk, at about—well, say 150,000 to 200,000 years ago. And the next step takes us to the Heidelberg race, which we had on the screen here—250,000 to 375,000 years ago. All those figures may be wide of the mark, you know; but I'd say it would be *fairly* safe to place the Heidelberg somewhere between 200,000 and 400,000 years ago. And when taken in comparison with your Arellian chronology, I'd rather say between 250,000 and 400,000."

"You can probably place your races since the Heidelberg from our later records, then."

"Yes, yes. I hope so. Yes. I certainly do hope so. Well, then the next step back is the farthest we on Marelli have been able to get yet. That is what is called the Peiping or Peking man, or the Sinanthropus Pekinensis, in what we call China, a very large, densely populated, and under-advanced country in Asia. Estimates, such as they are, place the Peiping Man as far back as a million years. How nearly accurate the estimate is I'm sure I can't say. You understand I'm primarily an astronomer. Probably it's as old as a million years—perhaps much older. The races I've mentioned furnish a fairly representative list of all we know about the prehistoric races of Marelli. Mind you, that's all in Europe, except the Peiping race. What was in other parts of Marelli concurrently we know very little about as yet. We know there were prehistoric peoples in other parts, but we haven't them very well traced yet. We'll have to wait until more excavations are made."

"Unless we can learn more about them from these records," suggested the centenarian.

"Yes, yes, to be sure. Of course. Well, let's see what we have next here, then."

THERE were then several records dealing with conditions on Arelli. They ran back 500,000 years, as nearly as they could tell, which wasn't very near, showing the surface entirely peopled, the seas filled with water, and the hundreds of thousands of craters which form so prominent a feature of Arelli's surface *entirely missing*. The people lived in cities of great size and grandeur, and the civilization was obviously extremely high. There were swarms of ships on the waters, vast transits on the land, *multitudes of airships*, and some sort of contrivance which men attached to themselves, floated up into the air, and darted swiftly about. Evidently this was much more than a mere gravitor. Most surprising of all, however, at the very end of the record, was a map which left no possible doubt of representing travel routes between Arelli and earth. By going over the record again more carefully they found the interplanetarian ships themselves resting on the surface.

As the hour was nearing when they must discontinue their work for the time being, they skipped over the remaining cabinets to glance hastily at the last two. These bore no dating. They supposed one might deal with Arelli and the other with earth; and in this they were not disappointed.

They ran the Arelli record first, and found it to consist of nothing but pictures—no comments. The scenes that flashed before them made the two scientists draw back with a gasp and look at each other in speechless bewilderment. The pictures spoke more plainly than words could possibly have done.

The first scene was a drawing, showing a large heavenly body, evidently a sun—*the* sun, they soon saw. Three planets were shown with their orbits about the sun indicated. Around the outer one—Marelli, they guessed—was traced an orbit, containing a satellite at one point, and near the satellite was an excellent outline of a human hand, with the index finger pointing to the satellite.

"Plainly our own sun, with Mercury, Venus, and Marelli, and circling the latter, Arelli."

"And according to the finger, this record is to deal with Arelli."

They nodded agreement.

The next showed a steaming sea in whose waters and on whose shores sported enormous animals as weird and terrible as could have been hatched from the brain of a madman. Then there were several areas of land. It was barren and shimmering with heat. It, too, had a varied collection of monsters. There were no forests; there was no vegetation; *there was no man*, nor anything in the least resembling him. Then, as if to say, "See? It is the same all over this sphere," many other like land and water areas were held up before them.

Followed the image of a sphere in the distance so completely shrouded with clouds of hot steam that not a foot of the surface could be seen.

The remainder of the record was a blank!

Mastono and Merriam sat looking at each other for a time in benumbed astonishment. Merriam spoke first, after opening and closing his mouth several times without emitting a sound.

"The beginning," he whispered hoarsely. "No human being on all Arelli."

Mastono spoke after another silence. Strangely, he, too, spoke in a hushed voice, as in the presence of the dead—or a spirit. "And taken—by whom?"

"By the people of Marelli, of course."

Mastono first nodded and then shook his head—both in silence, and in a moment, "Perhaps."

The younger man stirred, took a deep, hoarse breath. "Come. The other one, now. Perhaps——"

They lifted the cabinet down and placed the remaining one in position before the screen.

"This will explain the other—this one of Marelli."

Again the old man made the same peculiar ambiguous movement of nodding and shaking his head. "Perhaps."

If the showings on Arelli had left the two men in amazement, those now shown on Marelli left them even more so. There was the same manner of indicating the planet to be dealt with; then the same steaming seas with their enormous weird creatures; areas of hot land with its beasts; barren lack of anything like vegetation; *the same complete absence of the supreme animal, Man!* And, finally, the same representation of the steam-encircled sphere from a distance.

The same blank remainder of the record.

They sat silent a long time. At last Mastono made a gesture of futility, disconnected the cabinet, and set it with the others, and they went out together.

THE erros and ennas came and the erros and ennas fled on Arelli, as man's puerile efforts at timing come and flee on the myriads of inhabited planets of our universe and all universes. The beastly invasion

was being held in check everywhere now, and to those craters that had been abandoned and retaken, the hordes did not come again. In the progression of time, albeit a little longer time than Billy Upton had predicted—the force of the aggression stood still, then lightened a little, and finally ceased altogether, as the ghastly swarms forgot all else in their gasping agonies in the frigid and airless places and began to crawl painfully back as near as they could get to their infernal dens—to die.

The Terrors of Arelli were no more.

But at Copernicus and all the other inhabited places the people refused to return to their underground dwellings. The taste of the surface and the sunshine, the lakes and the mountains, the black bowl with its stars—the taste of these was sweet in their souls. No more for them the deep-hewn tunnels and caverns, however well lighted and commodious. They must be where they could see Marelli—Marelli, the home of the generally beloved Billy and Mercedes Upton, the home of the little bald-headed scientist whom they revered as the only one that Mastono, the Sage of Arelli, had ever been known to take into the innermost recesses of his scientific old heart; Marelli, the home of the Prince Harding, also much known as Prince Freddie, who had taken to wife their beloved Princess of Arelli, who was to bear him soon a citizen of two worlds; Marelli, the home of the genial and popular young Irishman, who, like the Prince, had mated with Arelli, and whose union likewise gave imminent promise.

"My child shall be a girl," smiled the pretty little Sanna, on whom the dignity of impending motherhood sat with fascinating sweetness.

Larry looked at her in mute adoration.

"That it shall," laughed the Princess of Arelli, "because my child must be a boy, so that he may some day be the King of Arelli, and they are to wed when they are of the wedding age."

Prince Freddie winked at Larry and held his tongue, as a man must in such case, Larry only venturing to whisper clandestinely, "Faith, an' what relation will that make us, Mr. Harding?"

Sanna: "My child shall be born on Great Marelli."

The Princess: "Mine *must* be born on Arelli."

As for Mercedes Upton, she said no word, but her eyes held a faraway look. Proving that Mercedes Gonzales de Montiel y Santander y Upton could hold her tongue and her counsel—even as the President of Peru had once averred.

The Terrors of Arelli being vanquished, the ships were preparing for their homeward flight, and the day was irrevocably set for the takeoff. On account of some pressing matters at Altara Mountain, Harding could delay his going no longer, and Larry was eager to be at work on plans for the new ships that were to ply regularly between the home world and Arelli. So the day had to be set for leaving.

And Altara and Sanna waited, eagerly expectant. Waited. Waited. And in the event neither of them got what she had avowed she would have, which, as usual in things of the sort, mattered not the least, being found at last to be the thing they had really wanted anyway. For little Sanna gave birth to a boy—a copy of herself but with the smiling Irish eyes of the father; while the projected future King of Arelli turned out a queen. Both were born on board the *Altarasanna*, out in the ether, far from both worlds.

Merriam besought Mastono to go to Marelli with him, but Mastono said he had so many important things to do at home that he would have to postpone the trip, greatly as he longed to make it. But being in the midst of a hot argument with Merriam, which must be concluded, he would step just a moment aboard for the purpose, and the two went into Merriam's special quarters to await the time for the takeoff. This was a small inside room in the rear which Merriam had selected for quiet.

In the end, the argument was concluded where it began, and they had to leave it until another trip.

But, "There is one matter I must give some attention to, when I reach Marelli," said Merriam, opening another subject.

Mastono leaned forward expectant.

"Yes, yes. I had meant to mention it to you before, my good friend, but I think there is time yet before the ship starts. Some years ago—1929, I believe, or possibly 1930 or 1931, a Dr. Hans Hartman succeeded in going down into the sea to a depth of 2,500 feet in a diving apparatus of his own invention." Mastono leaned a little farther forward. "He discovered an ancient city a few hundred feet down, possibly one that had been built there when that part of the area now covered by the Mediterranean Sea was a part of the lowland country about what were then two large lakes. I understand other cities have since been discovered there, but for various reasons they have not yet been explored to any extent. Now I was thinking there might be records buried there which, if we could find them"—etc., etc.

They were off on another lingual trek.

By and by Harding rapped, entered, and started in surprise at the sight of the centenarian, who he had not known to be on board. For did he not hear Mastono say there was much to be done on Arelli?

"Is it time for me to get off, Mr. Harding?" asked Mastono.

A ghost of a smile flitted over Harding's face, but he shook his head. "No, no. No hurry at all."

When he had gone out and closed the door, he grinned broadly, said something to Billy Upton, and they both laughed.

"They never knew when we started."

"O, well, old cheese, what difference does it make to a scientist where he is?"

With which they went about their several duties chuckling as they went.

THE END.

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Dr. Immortelle

By Kathleen Ludwick

A GRADUAL and systematic degeneration of the body cells, with a corresponding weakening of the brain cells, are what constitute old age and eventually bring death. When these cells are abnormally worn down by illness, for instance, death comes without old age. All of us have heard of cases where almost completely shattered cells were rebuilt and strengthened by the successful transfusion of healthy, normal blood. It seems not unreasonable to suppose, therefore, that a method of blood transfusion might be developed some time in the future that would aid the continuous rebuilding of body and brain cells enough to materially increase the span of the individual life and avoid the seemingly inevitable advent of old age. But Miss Ludwick has woven an excellent story around this theme, which we want you to enjoy first-hand.

Illustrated by MOREY

I HAVE to smile when I hear all this talk about rejuvenation, after the story Victor de Lyle told me, lying white and still on his cot in the hospital overlooking the ocean, the changing expression of his great dark eyes, the only sign of life about him. Dr. Immortelle beat them to it by about a hundred and fifty years. Strange that his theory has never occurred to any of our modern Occidental practitioners, at least not until very recently. I saw an item in the papers the other day that caused me to suspect that a European scientist had either discovered the secret for himself or perhaps gained his inspiration from the writings of the ancient alchemists, where no doubt Immortelle gained his.

I do not doubt that Methuselah lived a thousand years; I do not doubt that, barring accident, it is possible for men to live *ten thousand* years, if they so desire, or that men have done so and will do so again. Perhaps in time, longevity like that will become so universal as to be taken for granted. The process of rejuvenation will become as common as that of vaccination or the injection of the various serums and antitoxins that are now the fad of the hour. It may even become compulsory by due process of law! It will follow naturally that the Mrs. Sangsters of that day will be heard with respect and no doubt Malthus will have many statues erected to his memory.

Why shouldn't we be rejuvenated? Most of us have attained to but the vaguest conception of the meaning of life when "the black camel kneels before the gate." We hear a great deal about infant mortality, and it is indeed a pitiful thing: but the mortality of the mentally immature is also appalling and infinitely more tragic. But—goats' glands! The thought that gives one a feeling of nausea. I wonder if the results of that same operation in olden times, as the historian says, "shrouded by the mists of antiquity," do not form some basis for the legends of fauns and satyrs, those strange beings, half man and half goat, which figure so largely in Grecian and Latin mythology; and if, perhaps, the increasing number of such monsters did not result in the discontinuance of the operation? How shocking to become the parent of such a being! Thank heaven, there is another and a better way! At least it will be better if there is wide and general knowledge concerning it for the protection of humanity. To the dissemination of such knowledge I now devote the last days of my life. For myself I do not desire longevity. Such a desire died in me when a Red Cross tent was bombed on the French frontier. Perhaps it was for this that I came, alive, out of the hell of the Argonne!

I have none of the arts of the professional writer. I know nothing of the rules of short-story writing. I am just a plain mining engineer of mediocre ability, wielding a geological pick and hammer more easily than a pen and more familiar with mortars than metaphors. I could run a tunnel to tap a ledge in a porphyry dike easier than I can tell this strange tale. I know more about secondary enrichments than I do of the terminology and equipment of modern surgery, but if the layman can grasp my meaning, I shall be well content. Often, strangely enough, it would seem, it is the man in the street who anticipates the most astounding scientific discoveries and grasps their tremendous significance to humanity before his apparent intellectual superiors. I realize that, as Walt Whitman said of his poems, "It will do good—it may do much evil also." But I have faith to believe that the good will far outweigh the evil.

I STARTED for San Francisco one May evening from my parents' home in the Santa Cruz Mountains. It was a moonlight night, and there was little traffic on the highway. The air was soft and mild and

fragrant with the scent of innumerable flowers in the gardens of the homes that line the highway down the Peninsula for half-a-hundred miles. Even the humblest home in this favored region may possess the never-ending joy of flowers the year around, if nothing more than the humble petunia and the cheerful scarlet geranium. Where on the face of the globe, except on the shores of the Mediterranean, is there another section so favored by nature as that to which the inhabitants of the region bordering on San Francisco Bay all pridefully refer to as "The Peninsula"? It is the Mecca of the whole Pacific Coast. From the north they "go down to the Bay to get warm"; from the sunny San Joaquin, and further south, they stream up to the Bay "to cool off"!

Eastward towered the dark bulk of Mount Diablo.

. . . And the next instant we were falling through space——

To my right the waters of the lower bay flashed in the moonlight. On my left rose green, gently sloping hills, with their wealth of native shrubs and trees and their plantations of eucalyptus, reminding me always of those words of Howells':

"The inscrutable sadness of the mute races of trees."

I passed Palo Alto with its picturesque university buildings, silent witness to the good that the tragedy of one life may bring to countless multitudes; the salt heaps of Leslie shone white as snow in the moonlight as I passed. It pleased me to speculate on the appearance of the section I was traversing, when it should have been settled as long as London or Paris or Naples has been.

And so I neared the twin cities of San Mateo and Burlingame, the latter with its picturesque little railroad station. A couple of miles south of San Mateo I almost ran over a woman carrying a suitcase. I stopped and offered her a ride. Imagine my astonishment when I found it was Linnie Chaumelle. I had known her as a child in Idaho and she had grown into

the loveliest woman I have ever seen. I had long ago lost all track of the Chaumelles, but a few months previously had chanced to meet Linnie at the bedside of a friend in a local hospital, where she was on duty as a special nurse, and we had renewed our acquaintance.

It was the death of Linnie's little brother, Vernon, that precipitated the exposure of that strange and sinister being, Albert Immortelle, and his assistant, Victor de Lyle, and caused them to flee from the Wood River Valley "between two days." Immortelle asserted that the child had cut himself and he had dressed the wound. Linnie's uncle, an eastern surgeon of some note, arrived unexpectedly for a visit about that time. An infection developed and the child died. The child's uncle openly charged that the wound had been made by a surgeon, and that Immortelle had been performing an experiment of some sort. The Chaumelles were amongst the oldest residents of that section and highly respected. Feeling ran high and threats of lynching were openly uttered. Immortelle and his assistant owned one of the first automobiles in that section. They fled in the night, and in spite of the attention excited by the appearance of autos at that time, nothing was ever heard of them again until they reappeared many years later in San Francisco.

The strangest feature of it was that my own father stoutly affirmed that he had known Dr. Immortelle some forty years before and he had appeared no older at the time he left Wood River Valley. Dr. Immortelle insisted that he was the son of the physician my father had known, but father was positive in his identification. And to complicate matters still further, my grandfather declared that *he* had known this same Immortelle *sixty* years before! That he recognized him because of a peculiar triangular scar above one eyebrow. Dr. Immortelle asserted that this scar was a family mark—a matter of heredity: but my grandfather had served in the Civil War and knew something about wounds himself. He laughed at the idea that the scar was a hereditary mark. As he said, it was very unlikely that a grandfather and son and grandson should have been wounded in such a manner as to result in the same identical sort of scar in the same location. Moreover, the same explanation could not apply to Victor de Lyle. Both my grandfather and my father were willing to swear to his identity, so he could not be explained away so easily. The people of the camp were frankly puzzled. Both my grandfather and my father were men of unquestioned veracity whose sanity had never been doubted, hardheaded business men of good judgment and common sense. There was some mystery here. For those still living, it will be solved if they chance to read this narrative.

NO words of mine could convey a just impression of Linnie's beauty and womanly grace. She was the ideal nurse, with the physique and vitality that every nurse should possess; and besides, she possessed that dignity and nobility of character in which many nurses are sadly lacking. To meet her in such a place, at such an hour, staggering under the weight of a heavy suitcase, and in what I might almost call a disheveled condition, was inexpressibly shocking to me. She was a woman of very even temperament, but she appeared to be laboring under considerable excitement. She asked me to drive her to her apartment in the city: but after hearing a part of her story I turned the car and drove back down the Peninsula—past Los Gatos and through the canyon, to the ranch of my parents in the Santa Cruz Hills. Linnie's mother and mine had been friends in those long-past Idaho days and I knew my mother would give her the care she needed. I left her there and returned to the city.

The afternoon papers were filled with the details of the latest accident in El Diablo Canyon. Dr. Immortelle, a well-known local physician, and his associate, Victor de Lyle, had been conducting a sort of orphanage or sanitarium at Crescent Beach. Starting for the city at night, they had gone over the bank, into the canyon, hundreds of feet below. The accident had apparently been caused by their swerving the car to avoid running over the body of a tramp that some other car had struck and killed. Dr. Immortelle had been killed instantly and shockingly mangled, and Victor de Lyle had been fatally injured.

One of the puzzling features of the accident had been the presence of a woman's footprints near the scene of the tragedy; also the appearance of a young and beautiful woman at a little station down the Peninsula, who had appeared greatly agitated at missing the last local to the city and had started out afoot, carrying a heavy suitcase, apparently with the intention of walking to the next station two or three miles away, to catch the interurban car whose terminus was at that point. The theory was advanced that the footprints had been made by a woman occupant of the car that had struck the tramp; that, getting out of the machine, she had found the tramp to be fatally injured, and because of this and possibly other compromising circumstances, she had feared to inform the authorities. The mystery was never solved to the satisfaction of the police and detectives. Only one person besides myself and parents, and the actual actors in the tragedy, ever knew who made those footprints. That was my wife. Linnie made them—Linnie, my other self, who sleeps in a little French cemetery near where the Germans bombed the Red Cross tent where she tended the wounded and dying. I promised Victor de Lyle that I would write this story as best I could, but it would not have been given to the world in her lifetime had my wife lived. I am giving it to the world now because the time for my own passing draws near and I believe the world is ready for the wide and practical application of Dr. Immortelle's method of rejuvenation.

* * *

I WENT to see Victor de Lyle as soon as the physicians would allow me to do so. There were certain features of Linnie's story that I desired to have corroborated. Bit by bit, at the cost of the most excruciating agony, the recital spread over many days, he told me the most amazing story I have ever heard. There have been times since when I have wondered if I weren't as locoed as any Idaho steer that has been browsing on rattleweed: and then I remembered finding Linnie on the highway, and what my father and grandfather said about having known Immortelle so many years before, and thereby regain faith in my own sanity.

As a child I had always feared Dr. Immortelle, the sinister-looking older man with the dark, compelling eyes, despite his efforts to win my favor: but I had always liked his young assistant, De Lyle, with the ready, sympathetic smile and gentle manners and the kind brown eyes whose expression hinted of sorrow and tragedy. I wrote down his story as he related it to me day by day. Later I read it to him and he pronounced the most vital portions correct in every detail. Since then I have consulted various authorities, talked with physicians and surgeons of international reputation, and I am assured there is no serious technical error in the tale.

I can differentiate between lancet and scapula, bistoury and canula; I can even discuss the merits of the Aveling syringe as compared with the Collins apparatus or Spencer's instrument with the canula that

can be plunged directly into the blood-vessel. Also, I have opinions as to the merits of arterial as opposed to intravenous transfusion: but I had hard work learning to twist my tongue around such terms as phlebotomy, arteriovenous anastomosis, ambolism and thrombosis: and it was a long time before I got hep to the difference between Crile's tube and Payre's tube and Brewster's tube of German silver.

VICTOR DE LYLE'S STORY

"I WAS born a slave on a plantation in North Carolina in the year 1745. No, *not* 1845. I was born a mulatto. Perhaps you think my mind is affected—but wait till I have finished! My father was a white overseer and my mother a negress from the Guinea Coast and as black as ebony. I am not delirious—I am not insane—although I realize that it must be difficult for you to credit my statements." Incredulously I noted his soft, waving brown hair, his hazel eyes, his skin that in health had been fairer than my own suntanned hide. "You will believe me before my story is ended" he said sardonically. I did.

"My old master was of French ancestry, Huguenot stock. His wife's people were Pennsylvania Dutch—and Quakers. They were in one of the great treks from Pennsylvania to North Carolina. She had not hesitated to marry outside the faith in which she had been reared when she met and fell in love with the elder Immortelle. Perhaps it was from her that Albert inherited that mystical tendency which influenced his life so greatly.

"The elder Immortelle was the proprietor of a large plantation. Naturally, he grew the products peculiar to that region—tobacco, cotton, corn and horses. He had been educated for a physician but he had a passion for stock raising. Being an altruist, his knowledge of medicine and the crude surgery of the times was of incalculable benefit to the inhabitants of that sparsely settled region, and he gave of his time and services as freely to the most wretched slave as to the haughty proprietor of the most widely-stretching plantation. He possessed one of the finest libraries in America at that time. Among his books were some of the works of the ancient Alchemists. They possessed a strange fascination for his son. The boy would pore over them for hours when other lads of his age were engaged in riding or hunting or other local sports and pleasures usual to youths of their years.

"Second only to his interest in books was the attraction animals possessed for him, especially his father's thoroughbred herd. Even as a child he was always begging for pets. As he grew older, he would ask for them under the condition that they were to be his own exclusive property to do with as he pleased. His father was greatly pleased by the scientific spirit which Albert displayed in the breeding of the stock on the plantation. My master possessed some of the best specimens of horseflesh in that section. He fondly hoped to see his son become one of the most famous stock-breeders of his day. If he had suspected the object which no doubt inspired his son even at an early age, his emotions would have been of a different character.

"Albert turned his earliest attention to the breeding of poultry, cats, dogs, sheep and other comparatively short-lived animals, that he might observe the results of certain experiments on several generations. He was especially impressed with the disastrous results of inbreeding in relation to fecundity, and this formed the very basis of the theory he was slowly evolving and which was to be fraught with such tragic and momentous results to himself and countless others.

"Like most Southern gentlemen of that period, he was fond of gaming, wine and women: but so great was his self-control that I never knew him to overstep the bounds of sobriety. In gaming and the pursuit of women his methods were cold-bloodedly scientific; but I believe that during his whole lifetime he really loved only one woman.

"He was selfish and cruel, persistent in the pursuit of any object. He was a 'throwback,' a reversion to some strange type that one found it impossible to associate with either parent. His father and mother never understood him. He was an even greater puzzle to me who saw more of him than anyone else did. We were nearly the same age. His father had given me to him for his own personal attendant. It seems strange to you that I was ever a black negro chattel, doesn't it? But I assure you that it is true and I am able to verify this statement in every respect. I was his almost constant companion. For hours at a time he would pore over certain problems whose existence I did not at that time suspect. I have known few human beings capable of such intense concentration.

"When we were young lads, he said to me once:

"'Victor, when I will to move my hand, why is it that my hand responds to my will? It must be for the reason that every smallest particle of that hand has a consciousness of its own!' And this was long before Dalton had advanced the atomic theory. We had never heard of molecules or atoms, to say nothing of electrons! He had no modern microscope to aid in confirming his theories. No one at that time had ever witnessed the marvelous division of cells, the orderly action of centrosomes and chromsomes with which every student of histology is today acquainted and takes as a matter of course. His error lay in his theory of the manner of reproduction of cells and yet, in spite of this, he and I are, or were, living witnesses to the success of his experimentation.

"He acquired all that the colonies had to offer at that period in the study of medicine and surgery, then pursued his studies in London and Paris and even in other capitals of Europe. I remember once in Vienna—but let that pass! I accompanied him always and for his own purposes he educated me. There never was the same prejudice on the Continent against colored people that has always existed here in America.

"WE were in Paris at the outbreak of the Revolutionary War. A privateer nearly captured us on our way home. I have often wished that it had sunk us. Albert served through the war and I was with him as his personal attendant. Naturally, we were exposed to great dangers. I feel certain now that he was by nature cowardly, but his scientific bent of mind and the goal he had in view were sufficient to counterbalance his fears. He had the reputation of being one of the most fearless and efficient surgeons in the Continental Army. Strange that a man should so determinedly face death in his efforts to find a preventive of Death itself! How many revolutionary heroes lost their lives as a result of his experiments I have no means of knowing, but the total was doubtless large. I possessed a considerable knowledge of medicine and surgery, myself, for those times, which was all a part of my master's plans. He took great pains to instruct me in the anatomy of the nerves and blood-vessels.

"At the close of the war we settled in New York. We took a house in a secluded suburban section. Immortelle was then about forty years old and both of us commenced to feel the effects of years of military service with the inescapable hardships which would appear so incredibly severe to modern soldiers. My master's step was not so springy as it had been.

"Never have I seen a human being who dreaded the approach of age as did my master. It was while we were living in the New York house that he first broached the subject that must have been uppermost in his thoughts for years. I was astounded. His plans to make practical application of his theories filled me with horror, hardened to suffering as I had become during the course of the war. I am by nature conservative. Also, I had not the depth of intellect of Albert Immortelle, nor his scientific bent of mind. Even yet I have not entirely overcome what I might call the tendency towards inertia of the negroid race! And the tendency was very strongly marked in me at that time. Afterwards, I could recall many hints and innuendoes that should have prepared me for his disclosure and I wondered that I had not grasped his purpose sooner. Cleverly he dangled the bait before me.

"'Remember,' he would say when I wavered, 'only accident can bar us from attaining any age we may desire to reach. We can remain youthful and grow increasingly attractive with the passage of the years, instead of hideously ugly with wrinkled skins and bald heads and the yellow snags of age in our mouths that ever repel youth and beauty.' (Our dentists at that day were not capable of performing the miracles of artistic dental surgery that we take as a matter of course today.)

"Remember, he was my master—I his slave. Over me he had the power of life and death. Never was such a cunning tempter. He tempted me with the promise of freedom and the hope that through the gradual loss of most of my own blood, covering a long period of time, and the substitution of Caucasian blood through the process of transfusion, I might, to all intents and purposes, become a Caucasian. You cannot understand what that means, you who have not been an object of contempt and disdain through no fault of your own; you who have not been jostled brutally on the sidewalk and kicked off the curb by your actual inferiors, and felt yourself helpless to resent brutality and insult!

"Briefly, his theory was this: That the tiny particles of our bodies which we now call cells, breed and reproduce their kind in a manner somewhat similar to that of most animals; that the inbreeding through countless generations, in the body of a human being which they themselves compose, causes a loss in fecundity just as it does in horses and cattle; causes the cells to degenerate, to 'run out,' as we say of animals and plants; *and that this loss in fecundity is the true cause of old age.* He believed that, as stock men range far afield for new strains to strengthen the breeds of their flocks and herds, so new vigor might be acquired by introducing young and vigorous cells into the blood of the aged. *Necessarily, the cells to be so introduced must be from the vascular systems of youth;* and even then, I think, he glimpsed the truth which science has but lately demonstrated, that the character of the blood of an individual becomes fixed at the age of three or four years and thereafter remains constant.

"There is no doubt that the ancient Alchemists practiced this method of rejuvenation. Immortelle's error lay in his theory as to the manner of reproduction of the cells, which, instead of breeding with older cells in the veins of the recipient, simply multiplied through division in their new locations crowding out the weaker cells, and went about their tasks of building the body with new materials and removing the waste products.

"Transfusion is old—how old no man can say. It was probably practiced long before recorded history. A friend of mine who has accompanied several archeological expeditions to the Far East asserts that the Alchemists gained their knowledge from the secret records of a fraternity old before Babylon and Nineveh became but rubbish heaps covered by the shifting desert sands! It is a fact that transfusion was employed in the case of Pope Innocent VII, and there is a tradition to the effect that three young boys perished in the attempt. Perhaps the old legends of vampirism had their origin in such a source.

"TRANSFUSION is a common operation today, but when Albert Immortelle first broached the subject to me, an open announcement of our object would have been regarded with the greatest horror and only too well-founded fear of results would have rendered it impossible for us to secure subjects. Anesthetics had not yet been discovered and aseptic surgery was a hundred years in the future. We had to devise ways and means of securing subjects.

"It was my young master's plan to found an orphanage, whose most promising inmates he would later use for his transfusion experiments, which heretofore had included animals only. I was to be his first subject after the children; and when I had mastered the details of the process, he himself would submit to the operation. Of course, the danger as well as the suffering was incalculably greater than in these days of anesthetics and aseptic surgery. My master was skilled in the art of hypnotism, or mesmerism, as it was then called, but it often failed. Probably he was the first surgeon to use that strange force for anesthetization. It is a well-known fact that children are less susceptible to it than adults; and our subjects were all children, mostly of tender years—in fact all that *survived* were of such tender age! Tales of children of such age would in any event be treated as due to vivid imaginations. Even to this day I sometimes waken from nightmares with the agonized screams of those little victims ringing in my ears.

"Today there is practically no danger from infection and the danger from clotting is being eliminated through the division of humanity into groups classified according to the constituency of their blood. We had no aspirating syringe to determine the amount of blood taken from the donors and how many little victims lost their lives in this manner, as sacrifices to our rejuvenation, I have no means of knowing. It was, of course, unwise to keep records of such cases. All I know is that there were many fatalities. How we escaped with our own lives is a mystery to me. I am unable to fathom the inscrutable purpose of Providence in allowing us to cumber this earth for so long a time.

"When my conscience revolted, always before my eyes Immortelle dangled the bait of my own altered personality; for I had emerged, a radiant Caucasian, from my somber and repellent negroid chrysalis. As far as I personally am concerned, from a physical standpoint, I am, or rather was, a living witness to the success of his experiment. Even the most widely experienced ethnologist would hardly suspect me of having one drop of negro blood in my veins. No one who had known me as a kinky-haired mulatto youth, were he in existence still, would ever recognize that colored boy in the cultured, refined Caucasian with the waving brown hair, hazel eyes and complexion as fair as your own, with the rosy hue of health in his cheeks. From a selfish and brutal young savage with a violent temper, I had been transformed into an amiable and tractable individual, vastly useful to my master, but more conscientious than was conducive to my peace of mind or his. This was due, I am sure, to Immortelle's deliberate selection of children of most amiable disposition for donors in transfusion operations in which I was the recipient. For himself he always selected fearless and intrepid subjects of indomitable wills. Such wills are

often characteristic of amiable children. Stubbornness and strength of will differ from each other as widely as the poles.

"For the sake of greater safety, to be more reasonably certain that the blood of the donor would assimilate with my own, in the beginning Immortelle chose donors amongst mulattoes, then quadroons, then octoroons, before he selected white donors. He had formulated a theory which is now a well-established fact, that to introduce the blood of a higher animal into the veins of a lower is to cause the death of the lower. The negroid strain being predominant in my blood, and the negro race being inferior to the Caucasian, he logically reasoned that the introduction of pure white blood into my veins might result fatally to me. Always he bled me freely before a transfusion. It is probable that there is hardly a trace of Ethiopian blood in my veins today. Immortelle deserves credit at least for his scientific accomplishments. Intellectually he was a giant amongst the men of his time. When he commenced his experiments he had no safe and sure scientific ground beneath his feet. He was treading the insecure and shifting sands of conjecture.

"Always he emphasized the ultimate benefit to humanity of our experiments; but for many a long and lonely year I realized that his own chief object was to live as long as possible, in order to gratify his sensual appetites, however Epicurean they might have been termed, to the limit of danger to his hold on life.

"Every man with a drop of negroid blood in his veins has a passionate desire for offspring. Several times I contemplated marriage, but Albert always discouraged me, and, I realize now, placed all possible obstacles in the way of accomplishing my desire. Always there was the vexatious problem of the 'throwback,' the reversion to type. Mendel, the Austrian monk, had not formulated his famous laws at the commencement of our operations, but I believe Immortelle had a more or less hazy conception of the principles involved long before Mendel announced them to a skeptical world.

"In any event, Immortelle argued, if we married and had families, we must either witness the passing from life of our wives and offspring, or witness their endurance of the sufferings and dangers of transfusion. We knew nothing of aseptic surgery, but I believe my master grasped the principles of it before we commenced our experiments, for he always used boiled water and the scorched linen dressings that so many regarded merely as a superstition of old midwives.

"THERE was always the danger of thrombosis due to the admixture of certain bloods which refused to assimilate. Immortelle argued, with good grounds for his conviction, that it would be impossible to rejuvenate our wives and offspring even to the second generation, without knowledge of our methods becoming known. Someone amongst such a large group would inevitably give the secret away. Also when a hue and cry were raised, as was bound to be the case sooner or later, it would be difficult, if not impossible, to escape from popular wrath with a large number of relatives and dependents. It had been difficult enough on several occasions for our two selves. So reluctantly I relinquished my dream of conjugal felicity—the tender joys of one's own fireside, for the Dead Sea fruit of immortality in the flesh. I realized my error many long years ago: for I have come to know that immortality for the individual isolated from his kind could not atone for the loss of the happiness conferred by a perfect and harmonious union and the sweet delights afforded by the companionship of one's own offspring.

"Of course it was impossible to conduct an orphanage without attendants, and more especially female attendants. Ours were chiefly young women who had committed indiscretions and whose reputations had been saved by Immortelle and myself. They were obviously curious when assisting at transfusion operations, but their curiosity was never satisfied. The trained nurse had not as yet been evolved when we commenced our experiments in rejuvenation.*

"Naturally all our philanthropic efforts to save the reputations of the erring were not successful. Usually they covered their tracks in coming to us and always bore an assumed name. When they departed, only Immortelle and I knew how, or when, or what their destination was. We had many aliases, he and I, but used our own names most frequently. It was embarrassing to meet people one had perhaps known forty years before. In such cases, he often passed for a son of himself, as in Idaho, where, however, he failed to deceive your father.

"In spite of all, suspicion would fasten on us. Rumors would spread connecting us with various mysterious disappearances. We found it expedient to leave our New York address on one occasion, more hastily than was convenient. So it was with our Philadelphia orphanage and others we established in this country. It was the same with those we established in London, and in Paris and other Continental cities. In some locations we spent as long a period as ten years. In others no sooner were we established than some catastrophe would occur, which would spoil all our plans and send us scurrying into hiding. This was the case when we were compelled to depart so hastily from that quiet and comparatively isolated valley in Idaho, where you and I first met—you a child and I to all appearances a young and inexperienced physician, but in reality an old and saddened man with experience of agonies unparalleled by any other person save my master, Immortelle! On him they had had apparently no effect.

"In that little Idaho mining camp everything seemed favorable to our plans. It was a small camp and yet not small enough to allow each resident to become extremely familiar with the private affairs of all the rest. There was a considerable floating population, as in all mining camps, which was an advantage from our point of view.

"The absolute privacy essential to the successful prosecution of our plans was possible in the house we chose amongst the magnificent old cottonwoods of the river bottom and from which that beautiful but brawling stream derives its name. Earth does not hold a more picturesque spot than that narrow valley walled in by the precipitous mountains of the Sawtooth range. Often I close my eyes to see quite vividly again those miles on miles of cottonwoods. I recall the contrast of their orange hues in autumn with the dark green of the hardy firs that venture bravely down into the valley so far from most of their kind, and I see the thousands of acres of flame-colored chokecherry brush. And in the early summer, who that has ever seen them can forget those acres upon acres of blue forget-me-nots? In that valley they seem to disregard their naturally retiring habits that leads them to choose their abodes in the shelter of trees and shrubs. Away from all shelter, they boldly advance into the valley and flaunt their vivid hues under the bluer skies of Idaho!

"Our house, as you remember, was an old, flimsy, unpainted weatherbeaten structure, but easily and cheaply remodeled for our purpose, ostensibly that of residence and laboratory. Immortelle was supposed to be deeply interested in the study of chemistry. Naturally, in such a climate, where the cold is so intense for

*The first class of trained nurses was graduated in 1872.

a long period of each year, deep cellars are indispensable. We constructed a large one, also an underground laboratory with double skylight and heavy shutters which would prevent freezing of our chemicals and also serve to muffle any undesirable sounds and outcries.

"The river bottom consisted chiefly of gravel in which a small grave might easily and rapidly be dug at dead of night, if necessary. Also, the cottonwoods and thickets of wild roses, chokecherries and other shrubs hung with the creepers of the wild clematis, screened us in summer from inquisitive eyes and permitted easy access to a certain disreputable quarter of the camp. It was always possible in case of urgent necessity to secure assistance from this quarter, for there are always some nurses amongst these unfortunates. Dr. Immortelle never passed up anything. In return for his professional services he was usually able to obtain assistance that was almost as invaluable as his own. We were acquainted with the details of many a tragedy hidden from the knowledge of the general public. As you may know, it was the discovery by two little girls of the grave of a newborn infant, richly clad, in the gravel of the river bottom, together with the death of little Vernon Chaumelle, that precipitated our flight.

"There never was any necessity, from a financial standpoint, for Dr. Immortelle or myself to practice our professions. The proceeds from the sale of his father's plantation, to which he was the only heir, had been invested in Manhattan real estate nearly a hundred years before, as well as my own salary after the Emancipation Proclamation. The doctor's profession was only a blind, only a cloak for our real and sinister purposes.

"A CONSIDERABLE space of time is naturally required to establish a physician in a new location. Immortelle usually employed some length of time in judiciously cultivating the acquaintance of the local 'four hundred,' many of whom, sooner or later, he was absolutely certain, would require his professional services. It fell to my lot to make the acquaintance of the oldest inhabitants and, through them, to familiarize myself with the history of the best families, chiefly in regard to heredity, persistently recurring physical characteristics and freedom from blood taint of a certain character.

"The densely wooded river bottom furnished an ideal playground for the children of the camp. There were long stretches of clean white sand and gravel to play in; Indian paint brush to suck honey from; thickets of wild roses, willow clumps for shade with violets hidden in the lush grass of their shady recesses, coral flowers and fragrant red mallow. An ideal spot also for two human vampires to find a childish victim!

"Not being on the main line of the railroad, that section was rarely visited by tramps at that time, although at long intervals they used the willows for a camping ground. Down there in the willows we assiduously cultivated the friendship of the little ones through stories we told them, and the judicious gifts of sweets. We finally decided upon a donor for the next transfusion operation in which Immortelle was to be the recipient. Carefully we spun the threads of our web.

"The Chaumelles were amongst the oldest and most respected residents of that section. There was no blood taint in the family. They had been clean living and high thinking people for generations. One of the children, Vernon, met all but one of the doctor's requirements. He possessed no trace of cruelty, and he was a hundred per cent perfect from a physical standpoint. He was courageous, strong-willed, but not stubborn, and of more than average mentality. He was then scarcely five years old and Linnie, his little sister and constant companion, was a little over three. They often came to play in the willows with older children. One day they ran away by themselves from their home at the opposite edge of town. They were playing in the grove near our house when Vernon fell and hurt his arm. It was a mere scratch and really needed no attention. By dint of a little candy and considerable persuasion, we succeeded in getting them inside the house, little golden-haired Linnie, with the wide, wondering blue eyes, and dark-eyed, sturdy little Vernon.

"Linnie was left in our living-room, while Immortelle *extracted the splinter* from her little brother's arm. A box of chocolates and some wondrously illustrated story books, purchased purposely for such occasions, occupied her attention for awhile; but tiring of them, she found her way unexpectedly, through a door carelessly left unlocked, to our subterranean operating-room. I have never been able to forget the expression of her great blue eyes when she saw me in my white smock and cap, surrounded by the implements of my murderous occupation, and her little brother strapped securely to one table under the influence of the imperfect anesthetic, his pale face becoming ever paler as the life stream flowed from his little artery through the glass tube into the vein of the sinister-looking man reclining on the other table beside the child's couch. We were not yet using an aspirating syringe, which would allow us to measure the quantity of blood lost by the donor, and were alarmed by the pallor and weakness of the little boy. Even the two hardened creatures who assisted at the operation seemed frightened and conscience-stricken.

"I carried Vernon home, his little pale face resting on my shoulder. I had concocted some plausible tale to account for the prolonged absence of the children. The whole camp had been searching for them. I told a story of a fall and a wound caused by a piece of tin from an old can left by some hoboes at their camp, and a serious loss of blood. I promised to call next day and dress the wound in case it seemed inexpedient to take Vernon to the office. Dr. Immortelle was indisposed, having injured himself with a lancet in dressing Vernon's wound. What a hypocrite I felt; how vile I knew myself to be, when they thanked me so profusely for my *kindness!*

"You know what happens sometimes to the best laid plans of mice and men. Perhaps you recall the incident that led to our undoing; how Vernon's uncle, an eastern surgeon of some note, arrived unexpectedly on a visit and himself dressed the wound; how his suspicions were aroused. You remember how an infection developed and the child died, and how almost simultaneously the grave of a newborn infant was discovered in suspiciously close proximity to our 'laboratory.' Perhaps you can recall the investigation that followed. You may remember that a sort of catacombs was later discovered connecting with our operating-room, several bricked-up niches and their gruesome contents; but before that we were well on our way to safety. We owned one of the first automobiles in that part of the country.

"Your father declared that he had known Immortelle *himself* forty years before in the East, and not the latter's *father*, as Immortelle had always insisted; and to cap the climax, your grandfather solemnly averred that *he* had known this same Immortelle *sixty years before*, and that at the time he appeared in Wood River Valley, he appeared no older than at the time your grandfather had known him in his youth! One factor in his recognition and his positive identification consisted of a peculiar triangular scar over the left eyebrow. Had it been a birthmark it might have appeared for sev-

eral generations; but it was improbable that three generations would meet with an accident resulting in the same identically shaped scar in the very same location. Some who had known your father and grandfather well for many years were frankly puzzled. They knew them for men whose reputation for truth and veracity had never been questioned. Others were greatly amused and openly accused them of being the victims of hallucinations. They made sarcastic references to the Wandering Jew, to St. Germaine, to Lord Lytton's well-known hero, Zanoni, and that lesser-known but no less remarkable character of fiction, Melmuth the Wanderer.

"AFTER some years we returned to San Francisco. Both of us were younger in appearance than when we fled from Idaho. Also, there were several little graves in the Argentine, whose occupants, if they could have spoken, might have thrown considerable light on the source of our youthful appearance and whose piteous tales would have wrung the hearts of humanity and brought down swift and terrible retribution on the vampires who had waxed young and strong on their suffering and the sacrifice of their young lives.

"It was not long until Immortelle was practicing successfully again, with a numerous and fashionable clientèle. He soon acquired a reputation for philanthropy by contributing princely sums to various orphanages and other charitable institutions for children, and was always ready and willing to attend the little unfortunates they harbored, giving his services freely and without charge. Also, he did much charity work amongst the children of the poor, although not nearly so much as he was given credit for doing. I myself did a large portion of the work he was credited with. He was known to be deeply interested in the study of heredity and was a specialist in blood transfusion, which becomes increasingly safer, because of the continuous progress in aseptic surgery and the classification of humanity into groups according to the constituents of their blood.

"When at last his reputation seemed firmly established, he purchased an old house in the midst of a large, wooded acreage close to the ocean shore and within sound of the breakers, many miles south of the city. It had formerly belonged to an eccentric and wealthy recluse, who had chosen this secluded situation for his retirement. The advent of the automobile had changed conditions somewhat and a highway ran a comparatively short distance from the place. The house was an old, rambling structure. It stands on a rocky promontory overlooking the ocean, surrounded on two sides by a tall, thick cypress hedge. Little did the passing motorists dream of the stairs that led down through solid rock to a tunnel connecting with the ocean, and in which a stout boat was always moored.

"It was here that we established an orphanage and sanitarium for a small number of children, after thoroughly remodeling the old place. For these children Immortelle had conceived a deep and eternal interest and affection, but he sometimes remarked, with the most wistful expression and in an extremely melancholy tone, that no sooner had he become deeply attached to one of his young protégés than Fate would operate in some strange way to deprive him of their companionship—a fact which I thoroughly understood and was well able to confirm. He might also have added that Fate had seen fit to deprive him of the services of several nurses who had assisted at transfusion operations which had terminated unfortunately.

"Of course all our philanthropic efforts to avert disgrace did not terminate as we could desire. There were a number of mysterious disappearances of young women from that region which have never been explained to the satisfaction of—shall we use the stereotyped formula of 'the police' or of the 'general public'? But in the public mind our own institution was never connected with them in any way until that accident in Deep Canyon.

"DURING the influenza epidemic, beautiful Linnie Chaumelle entered into our lives again, Linnie whom we had known as a child in Idaho and whose little brother Vernon had virtually met death at our hands. All the nurses in San Francisco were either in attendance on victims of the epidemic or ill themselves when it made its appearance at our orphanage. Linnie had chosen the career of a trained nurse. There is no finer or nobler under heaven. Her parents had both died when she was quite young and the family had become widely separated. Very likely she had forgotten the names of Immortelle and myself. Albert engaged her without a personal interview, contrary to his usual habit, on the recommendation of a brother physician. It was something we had never done before, but our need was urgent. When they met, it was obvious to me, who knew him so well, that with Dr. Immortelle, the selfish, cynical, absolutely conscienceless man of the world, it was a case of love at first sight!

"It was not to be wondered at. Linnie Chaumelle is the most beautiful woman I have ever seen during more than a century and a half of evil living. She could well have served some great artist as the model for an angel, with her rose-leaf skin, her masses of chestnut hair with its glints of gold framing her lovely face; and those large, limpid blue eyes, through which one may glimpse her radiant soul.

"As time passed, it became increasingly evident that, for the first time in his evil existence, Albert had fallen victim to that little god who is no respecter of persons. Day by day I watched his love for Linnie grow. He vainly endeavored to exert his undoubtedly great hypnotic powers over her, but no evil power could affect that pure spirit that occupied a plane so vastly superior to his own. I had determined, in any event, that her mind should be kept free from the octopus-like tentacles of his hypnotic powers at any cost to myself.

"As I have said, all our philanthropic efforts did not terminate as successfully as we could have desired. It was while Linnie was at the sanitarium that one of the disastrous terminations occurred. Linnie is not naturally suspicious, but she is a young woman of more than average intelligence. As a nurse, she possesses from observation a wide knowledge of evil in countless manifestations; but her own soul has remained uncontaminated. She had not been there long before various circumstances combined to arouse her suspicions.

"I have mentioned a subterranean passage. It was convenient in case of emergency; and yet we found that stout ropes and even chains attached to pallid bodies of unfortunates and anchored by heavy weights have been snapped asunder by the violence of the breakers on that rocky coast. It was an incident of that nature that led to Immortelle's decision to dispose otherwise of the remains of a young and beautiful unfortunate and that likewise led to our undoing. Fate is a tricky hag! I should say, more correctly, what I now know to be the truth, that the time was at hand for reaping what we had sown.

"We had spent most of the previous night in digging a grave in the mellow soil of a small, isolated country place down the Peninsula. The ground belonged to me and I objected to this use of it, but my objections were silenced as usual by Immortelle. We removed the mute witness of our evil deeds from the sanitarium under cover of darkness, as we supposed, without the knowl-

edge of any of the inmates except the one nurse attendant on that case. We had no reason to fear that she would make any damaging disclosures.

"Immortelle placed the poor body in the rear seat and sat beside it, supporting it in an upright position, while I drove the car. As I have said, he was by nature cowardly, and not all the transfusions from the veins of courageous donors had ever overcome this tendency. A large touring car followed us somewhat closely. Immortelle suspected that they had some suspicion of our sinister design, or that they might contemplate a hold-up. I think he was entirely wrong, but at any rate he became greatly agitated and was thrown into a perfect paroxysm of terror. His great black eyes rolled like the eyes of a maniac, his pallid face forming a startling contrast to his raven hair. His forehead was covered with great drops of perspiration and he was shaking as if with an ague. In any event, they could hardly have overtaken us. Our car was specially constructed for speed—as a physician's car should be, of course! Only we knew what speed it was capable of attaining. But he was terror-stricken, incapable of reasoning.

"'Faster! Faster!' he screamed, as I drove the car at dangerous speed around sharp curves on the brink of a five-hundred-foot precipice. We managed to elude our pursuers, if such they were, by turning off into a little-used road and waiting until they had passed; then we turned back into the main road. Never have I seen a human being in such a panic. In spite of my remonstrances he made me stop as close to the brink as possible, where the cañon wall fell away below us for hundreds of feet, and compelled me to assist in pushing the poor girl's body over the edge into the abyss below. Then we re-entered the car and drove on to the city.

"In the ordinary course of events, the corpse would have remained undiscovered for years, perhaps until identification had become difficult, if not impossible; but in avoiding Scylla, we had become engulfed in Charybdis. Some Boy Scouts climbed down into the cañon next day to recover a lost hat and made the gruesome discovery of the remains!

"The papers were full of pictures of the poor victim who was not identified for a considerable space of time. They were full of supposed details of the crime. We felt comparatively safe, as only one of our nurses had been in attendance on the victim and we had every reason to feel sure of her discretion and loyalty. We had taken special precautions in regard to the arrival at the sanitarium of the girl now dead, so we felt confident that only the three of us had seen her there; but it happened that, of all persons in the world, Linnie had by accident, through the opening of the wrong door on a certain occasion, obtained a passing glimpse of her and recognized her picture! She went to Immortelle at once. Her wonderful eyes rested steadily on his as she said:

"'I will ask you to take me to the city immediately, Dr. Immortelle.'

"HE remonstrated, but it was useless, so he agreed that we should take her in to the city that evening. Then he laid the hideous plan in which I apparently acquiesced.

"'She knows too much, now!' he said, his face distorted with rage and fear. 'She must be silenced!' I shuddered. I had heard those words from him so many times in the course of close to a hundred and fifty years. I am certain he had come to feel the same towards me because of my increasing repugnance toward the course we were pursuing, which must have been obvious to him. My awakening conscience must have become a source of alarm to this man, himself, without even the vestige of such an inconvenient faculty. I believe that he had planned my removal, as soon as it could be conveniently accomplished and he could secure the assistance of a confederate to take my place.

"We owned a cabin in a secluded nook, not far from the road, yet far enough to prevent any sounds of terror or agony from being heard by passing motorists. It had proven convenient for our purposes on more than one occasion. Its windows were heavily shuttered and it was surrounded by dense shrubs and trees, so that its existence would ordinarily have remained unsuspected by passers-by. Immortelle proposed that we should start for the city with Linnie. We were to develop engine trouble when opposite the cabin. Knowing that Linnie would not care to remain alone with him on the highway, such was the repugnance with which he evidently inspired her, I was to go to the cabin for the tools we should find necessary, and she was to accompany me. The rest would be easy, he judged from certain past experiences of a similar nature. After she had been drugged and rendered insensible and was at his mercy—after she had been kept at the pleasure of his will as long as suited his purpose, he judged she would become sufficiently tractable. Her own few remaining relatives were far away and she would probably not be missed for an indefinite period.

"I had an entirely different plan. I reverenced Linnie as I have never reverenced any other woman. I instinctively sensed the incorruptible purity of her soul, her unlimited sympathy of that maternal character which persists, though even in the very slightest degree, in the most debased and corrupted specimen of femininity. I would gladly have given my life to save her from him. I had no hope that she would ever care for me—no desire to bind her pure life to mine, with its innumerable crimes. I had ceased to crave for continued existence. The many crimes in which I had been Immortelle's accomplice, although for years unwillingly, lay heavy on my conscience. From myself the world had nothing more to fear; but the conscience of Immortelle was unawakened. He was a menace to humanity. I decided that the greatest service I could render humanity would be to put an end to his career, even at the sacrifice of my own life.

"We left the orphanage that evening after dinner. I was driving. Linnie occupied the seat beside me, refusing to sit in the rear seat with Immortelle, where, unknown to herself, only a short time before he had supported the body of a victim. Not far from the cabin that was to be her destination, and not far distant from the place where we had thrown the body of the young nurse over the cañon wall, I ran over a pedestrian. He was a tramp, clad in khaki-colored clothing—you know its low range of visibility—but we might have avoided striking him had it not been for the excessive speed at which we were traveling.

"'Drive on! Drive on, you fool!' screamed Immortelle as I stopped the car. All of us got out. The man was fatally injured but he still breathed.

"'Dead!' said Albert nonchalantly. He took the victim by the feet and dragged him out of the road.

"'Get in!' he ordered, as Linnie stood there, white with horror.

"'Surely you will not leave him there!' she gasped. 'The man is not dead!'

"'He is only a tramp! What difference can his life or death make?' snarled Immortelle.

"'He is a human being! If you leave him here you will leave me with him!' she said defiantly. The spotlight shone on Immortelle's face. It was black with rage and murderous. *And then Linnie remembered!*

"'I know you now, you fiend!' she said, and took a step nearer and shook her finger accusingly at him.

"'*You are the man who killed my little brother!*'

"Immortelle snarled like a trapped animal. There was the flash of steel in his hand; but before he could spring on Linnie with the knife, I had struck him on the head with a revolver. Then I trussed him up with a tow-rope and a dog-chain we had in the car. The tramp had breathed his last. I dragged both of them into the bushes. I put Linnie into the car.

"'I will return for them,' I said in answer to her unspoken question. We started for the nearest little railroad station, thinking she could catch the midnight local to the city. On the way I gave her the barest outline of this story. She is a nurse and acquainted with the marvelous results of transfusion, with all the latest aids and discoveries of the scientific medical world. Perhaps she thought me a mere madman, but I fully believe she accepted my story and had faith in my repentance. I made her promise to say nothing *until she should hear from me again.* I wanted to keep her name out of the papers. You know what they are. We had engine trouble in truth and it was late when we reached the outskirts of the little station where she was to take the train. Immortelle and myself and our car were well known there and I judged it best, in spite of the lateness of the hour, for her to proceed alone.

"'You will probably never see me again,' I said at parting. 'Think kindly of me sometimes, if you can.'

"'Do not go back!' she begged. 'I am afraid for you! He will kill you!'

"PERHAPS she sensed that bit of good in me which persists in the most hardened. I had saved her. Perhaps she grasped my plan, telepathically, and shrank from its accomplishment, for her forebears have been law-abiding people for many generations. I took her hand and kissed it. The little innocent, with an impulse which sprang from her recognition of my genuine repentance, her gratitude, and her own strong maternal instinct of protection, put up her pure lips for me to kiss, she with her lily-white soul and I with my soul as black as my face once was! I was not fit to touch the hem of her garment with my lips, but I kissed her once. Nothing can erase the memory of that kiss. That second of supreme bliss was enough to recompense me for all I must face here and in the hereafter. I know you do not begrudge it to me, you who are destined to be her mate. Remember that, though I have practically become Aryan in body, my soul is still that of an Ethiopian — and colored people have strange moments of clairvoyance, whose reason is known only to the occultist.

"I drove away and left her. I have seen death in countless forms; I have been an accomplice, times without number, in what practically amounted to murder under the guise of scientific experimentation; I have witnessed scenes of horror whose remembrance fills me with an agony of remorse; and tears had been strangers to my eyes for what seemed like ages; but when I drove away and left here there, I could hardly see to drive for the blessed tears that filled my eyes. You know what happened — that she was too late for the local and started to walk to San Mateo, carrying her heavy suitcase. And how you came along and picked her up, thank God!

"I returned to the spot where I had left Immortelle and the body of the tramp. It makes cold chills run up and down my spine even now when I remember the look in Immortelle's eyes when I turned my flashlight on him where he lay bound and gagged. His eyes seemed to emit veritable flashes of venomous light. I almost quailed before him, bound and helpless as he was; but the thought of Linnie put courage into me. And I realized that my failure to carry out my plan meant death for me. My one fear was that someone would come along before my work was done, but there was little traffic over that road at night.

"'Now I am going to drive both of us over the cliff,' I said. 'If it were not for dragging *her* name through the mire, I would surrender myself and you to the authorities. But Justice is sometimes slow and uncertain. My plan seems the surest. I do not hold myself less guilty than yourself, although you were the greatest criminal in the beginning. However, I awoke, long ago, to the enormity of our crimes and would have endeavored to atone, in some measure, had you allowed me to do so. I have never been able to detect the slightest evidence of repentance in you. I wish it were possible for you to meet the fate you so richly deserve, in full possession of your faculties, but I dare not risk it. I shall be compelled to give you a few shots in the arm to insure your good behavior, for I shall have to unbind you to make the execution appear to be an accident.' Almost it seemed that he would break even the stout chain in his frantic struggles to escape the awful fate that threatened. I drove the needle in deliberately, and often enough to render him incapable of resistance.

"I placed the tramp in the middle of the road. Then I lifted Immortelle into the machine, backed down the road some distance, came on at the rate of forty miles an hour or more, swerved the car as if in an effort to avoid running over the body of the tramp, and the next instant we were falling through space — down — down——

"You know how they picked up Immortelle, crushed and battered out of all semblance to his former self; how a tree broke my fall and they found me with my head and face unmarred, but with my back broken by the boulder I struck. Obviously, the papers all agreed, and I later corroborated them, that it was an accident due to the driver's swerving the car sharply in an effort to avoid running over the tramp. The most puzzling feature was the presence of a woman's footprints at the scene of the tragedy, a mystery which has never been solved! A possible solution was that the tramp had been struck by a hit-and-run woman motorist, who, finding that her car had killed the pedestrian, after getting out and examining him, had driven away and feared to report the accident.

"Immortelle's vast fortune will revert to the State, as he left no heirs. My own fortune I have left to be used for scientific and medical research, more especially with regard to blood transfusion and its free and scientific application for the benefit of suffering humanity.

"Sometimes as I lie here, I wonder if evil, or what we call by that name, *is* ever employed in the scheme of things for good ends. Can it be needed, like the substance we place at the roots of flowers to cause them to bloom more luxuriantly and more radiantly? Well, I shall soon know!" he said with that prescience of approaching death with which I was so soon to become familiar on the battlefields of France. He passed away that night.

Before I left him he made me promise to give his story to the world, *believing that in proper hands, under scientific supervision, transfusion might prove of tremendous value to humanity; that it might be employed, not only to rejuvenate, but to repair and remedy both physical and mental defects.* I have done my best. As I have said in the beginning, I am only a mining engineer, more familiar with the symbols of mineralogy and chemistry than with figures of speech.

Linnie and I both went across to France soon after our marriage. I remember the night we left San Fran-

(*Continued on page* 574)

The Triple Ray

(*Continued from page* 529)

the infra-red ray was achieved. The cutting of this prism was an amazingly difficult matter, since the red rays must be bent through it and returned so as to exactly coincide with the course of the violet. The prism itself cost a small fortune, since at that time quartz was worth its weight in diamonds.

In order that the lay mind as well as the scientific may understand, I will go a bit into detail and describe the X-Ray outfit, since this was of prime importance. The outfit itself consisted of an adjustable arm holding a heavy bowl made of glass and lead mixed. Two deep slots in the sides of this bowl were for the purpose of admitting the arms of the tube when it is set in the bowl. The tube itself has much the appearance of a smooth glass cabbage, with glass arms extending axiswise. In the center of the tube is a spark-gap, across which the current jumps, striking against a tungsten target set to receive it at an angle of forty-five degrees. The X-Ray is produced by this impact and is directed outward at right angles to the target.

The real success of Lucius Raymond, I am convinced, lay, however, in the fact that he first introduced a gaseous element into the tube, which he then operated so instead of as a complete vacuum. What this element may have been I do not know, other than that it was subjected to a storm of radioactive particles before it was used. Prof. Raymond was fanatically reticent about this and feared inordinately that the formula would fall into alien hands. I do know, however, that at the first charge of current through the tube it changed from a clouded appearance to instant invisibility, and it was my friend's boast that thereafter he would defy anyone to detect its presence, let alone attempt an analysis of it.

But though indetectable, its effect was mighty. Leaded glass alone could withstand its power once it had left the prism, and even this melted away after a few moments' intense exposure to the ray so generated. Both he and I were elated at its success.

But in his attempts to present this to his government he had to follow a long and hard bureaucratic road. It was either this official wasn't interested or that one was away playing golf or the entire War Department was in a coma and didn't give a hang. While in this last condition, no doubt, they finally gave Prof. Raymond an opportunity to demonstrate his machine.

I can still see bluff old Admiral Ryan with his gray walrus mustache and twinkling eye. He was in charge at the Navy Yard. Lucius Raymond and I had just arrived at the proving ground. I carried the small black case, no bigger than a portable typewriter, which held his machine.

He gave us a quizzical look and asked, "Well, where's the new cannon?"

When I held out the black case, the old man fumbled quickly with his mustache, which concealed, I knew, a wide smile. However, he led the way through the gates and advanced onto the wind-swept proving-ground beach.

"Well, gentlemen, there's your target," and he swept his hand in a gesture toward a huge block of steel which was up-ended in the sand almost at the edge of the rolling Atlantic. "A sixteen-inch shell would have mighty hard sleddin' to come out on the other side," he added and ended sceptically, "but maybe your black case can go around it or over it," and he laughed. I laughed as well, since I foresaw the surprise ahead of the Admiral.

A small stone building some three hundred yards from the target had been fitted up as a temporary laboratory. There Lucius and I unpacked the case, connected up the tube, which was scarcely as large as those used for dental X-Rays, and then set the timer.

It had taken but a few moments. "Very well, Admiral," said Lucius. "Shall we step outside and watch? I have timed the automatic trigger to release in sixty seconds."

"H—m. All right," he agreed, visibly unimpressed, and we passed out, with Raymond's tall, cadaverous figure in direct contrast to the stocky build of the Admiral. Outside the building the grizzled old fellow took up his stand with legs planted wide apart—directly in front of the window-opening for the ray!

"My dear Admiral," said Lucius quickly, "if you please! You are directly in the path of my ray. Your atoms are far too valuable to be freely scattered to the elements." The old fellow jumped quickly and nervously moved aside with an embarrassed laugh.

As he moved a tiny bell within the building tinkled. "In ten seconds," Lucius said, and quietly counted aloud. As he reached ten a faint, burring sound came from within the building.

Every eye was fastened upon the target, including those of a group of officers present. And I could not but help feeling a small gush of pure pride at my own small part in the Twin Ray. For immediately a tiny cloud of dust appeared to float from the center of the steel block and vanished quietly into the air, while the early morning sun shed his first bright beams through a clean, round hole in the target's face. It was easily a foot in diameter.

"By Gad, sir," gasped the Admiral, "you did it! And here I've hammered away at these targets for thirty years, and you turn a trick like this without batting an eye." The old gentleman, in his above-board, straightforward training in powder and shell, was utterly stunned at the subtle efficiency of the new weapon. He shook his head slowly and sadly. "The thing's beyond me," he said, then continuing with spirit, "Why dammit, it's devilish. Suppose someone had stepped in front of it," he was ludicrously indignant, "why, he'd be dead and nothing left to bury!"

"Imagine a hostile army in front of it," Prof. Raymond remarked, speaking to him in his own language. "A sweep from left to right, thirty seconds at most, and they'd be gone."

"Yes, yes, I know," he replied, and I could see a troubled light in his eyes. "But, by Gad man, I'd never be the one to turn it on 'em. War is one thing. Out-and-out slaughter is another. If I wiped out an army that way, I couldn't sleep nights afterward!"

One couldn't help but understand and sympathize with the man. In common humanity a nation could scarcely turn loose such a force as this other than as a last resort. "No, Admiral," I broke in, "I don't believe it will ever be used in that way. Our possession of it will become known shortly in diplomatic circles, and no nation will dare attack us with their obsolete bombs and cannon. It is, in fact, only an insurance policy against war." Prof. Raymond nodded agreement with me.

"Um. Well, yes, of course. That's different," muttered the old man, a trifle at sea with the innuendoes of international diplomacy.

"Should the tube be stolen by an enemy," explained Lucius, "it would be of little value, since it must be re-

charged periodically with an element they cannot possibly detect in the instrument. Within a short time they will find their stolen tube had become but an inefficient X-Ray machine and would be valueless until charged with this gas, the formula of which is now in a vault at Washington."

The Twin Ray indeed was remarkable, but it took the addition of a third element added to the ultra-violet and infra-red rays to produce the final product called the Triple Ray. A current from a circuit equal in voltage to that used in the X-Ray tube was passed through the metal shield used to "sift" out the X-Rays from the useless visible violet rays immediately after the mixed stream of violet and ultra-violet rays have emerged from the tube itself. It is effective, since the visible rays cannot penetrate solids while the invisible or X-Rays find it no barrier to their passage. The current through the shield gave us, purely by accident, the amazing Triple Ray.

Lucius Raymond had been using this plate in some experiment. I cannot now remember what, other than that it had no bearing on his ray work, and through an oversight had neglected to disconnect it before placing it in the machine for filtering. It was a night of unusual brilliancy, both moon and stars shining brightly as I well remember. Through great good luck the machine was trained through an open window, else it would have been our last experiment.

WHEN Lucius turned on the "juice" in the tube, we both received the greatest surprise of our lives. An intense ray of pure white light sprang from the nozzle of the machine with a sound like the splitting of heavy canvas. To the eye it appeared no thicker than the filament of a seventy-five-watt electric bulb, but it was incomparably more brilliant.

In the night sky directly in the path of the ray was a wisp of cloud. This instantly vanished with a violet flame and a resounding thunderclap.

Next day the papers mentioned the unseasonable thunder and lightning. And the following night several observatories which chanced to be trained on the moon discovered an apparent volcanic activity on one of the lunar mountain peaks. This troubled Prof. Raymond, since by careful calculations he discovered that it was upon this very part of our satellite that his machine had been trained. It would appear that the ray had not ended its career upon destroying the cloudlet but had continued on into space.

It was a matter of great interest to us to watch this eruption and calculate how long it would continue. But there has not in the past ten years been the slightest abatement in its activity. Such power from an ordinary lighting socket is all but unimaginable. But the power of the atom is quite beyond the comprehension of any ordinary person. Indeed, I doubt if Lucius Raymond himself ever fully realized the terrific forces with which he worked.

But my friend was filled with immeasurable joy at his success. And I myself fully shared his elation, for to be even a small participant in the unraveling of the atom is no small accomplishment.

Prof. Raymond proposed to retire at once to a small lodge in the mountains, where he often conducted investigations which required unusual concentration, since he realized that to continue experiments in a crowded locality would endanger thousands of lives.

At his lodge Lucius Raymond had installed an unusually large storage battery, which was charged by utilizing a turbulent mountain stream which flowed near by. This was of course indispensable to our work.

A quality of the ray particularly puzzling to us both was its intense visibility. Both ultra-violet and infra-red are invisible, and we could not find that the current through the filter plate added to these should make them visible in the triple combination.

The explanation was simple and, strangely enough, occurred to me before it did to Lucius. The ray merely blasted the air through which it passed, since the atmosphere consists of atoms as does every other element. The bursting of the air atoms also accounted for the sharp, racketing sound which accompanied the ray.

Still another thing which puzzled us and puzzles me still is the fact that the ray wouldn't come anywhere near the correct figure for light velocity in the tests Prof. Raymond made. This was later to cause my friend many a sleepless night as he tossed his long frame uneasily in his bed, worried and apprehensive of the fearful force he had unloosed, and which he was convinced was to cause the destruction of the earth and all his fellow men. This velocity question was in fact the bottom reason for my friend's alleged failure as a scientist. At the time, however, he did not investigate this phase further, as he had no accurate light-measuring instruments at the lodge to work with.

Within a few days of our arrival at the lodge we were notified that the powerful X-Ray tube Lucius had ordered was prepared, so accordingly I drove into the city and got it. We were now ready to experiment on a large scale.

The first subject my friend chose was a dead tree upon the summit of a small mountain about three miles across the valley. Night was chosen as the ideal time for the experiment, since one could then best focus the sighting ray, a harmless combination of violet and ultra-violet, giving a silvery beam of illumination.

The machine was focused through an open window of the lodge and bearing directly upon the tree. We ourselves went into an inner room, which had stone walls three feet thick, where the control switches were located. The Professor turned the control switch full into the tube and then, watching the tree from the window, he quickly closed the switch to the plate for a fraction of a second.

It worked! Indeed yes, it worked beautifully. The beam cut the air with a deafening blast, though its diameter was scarcely that of a twenty-five-cent piece. The tree vanished in a blue flash that surged straight up to heaven like a volcano. And close upon its going came a second detonation which threw me heavily against the wall, while Lucius grasped the window ledge lest he be pitched bodily through the pane. The lodge itself, with its granite wall-blocks grating together disagreeably, rocked as if in an earthquake.

When the dust had cleared and I had rubbed some of the soreness out of a bruised shoulder, I looked and saw the tree was gone. But that wasn't all. Directly beyond it was a slightly higher mountain formation. The ray, after dispatching the tree, had not stopped, but had instead continued and sent the top of the small mountain into eternity! The jagged plateau that had been leveled still smoked and steamed as we gazed at it. The silver gleam of the moon cast a weird veil of unreality over the scene.

Under the light of this same moon my friend and I immediately set out on a feverish tour of inspection. We found the tree had vanished without a trace, leaving a hole where its roots had been. The plateau-top we found a mass of hardening rock- and sand-lava. It was fast approaching the consistency of a pavement. Lucius Raymond pointed out across the center a narrow groove hollowed out as if by fire which marked the course of his ray, which had lifted the surrounding mass of earth as a swift boat will shatter a wave into fragments on all sides.

The early morning sun was rising when we finally

returned to the lodge, and while Lucius prepared breakfast I walked through the wood path to the nearest road, where the daily paper was left in our mail-box. I did not pause to open it on the way back, as I was famished and the thought of food superseded all else for the moment. Therefore I was taken completely by surprise at the headlines when I sat down opposite Lucius. Mount Hanover the night before had blown one-third of its summit off into space. Great seams had opened in the earth for miles about its base, and a vast deluge of melted rock and earth lava had crept down its sides like wax from a guttering candle. No one could explain the phenomena, since Mount Hanover was not even of a remotely volcanic origin. Experts were then studying the region to find an explanation for the explosion and shock which had been of super-volcanic violence and had even registered on the Washington seismograph.

As I read this aloud a slow suspicion came upon me and, looking up, I saw a darkening expression come over Prof. Raymond's face. He quickly reached into the table drawer for a map and, reading no more, I joined him in a careful study of its area. But from the first there was no doubt in either of our minds. It was with a sense of resignation that we found that a line drawn from our lodge through the small hill opposite would cut squarely into Mount Hanover at a distance of nearly five hundred miles.

AS a final confirmation, I found a bit further along in the newspaper article that a number of folks who had witnessed the phenomena claimed that a strange, bright circle of light about a foot in diameter had marked the mountainside as it exploded. Twelve inches would have been the approximate spread of cross-sectional area the beam would have made in that distance. I could fully sympathize with Lucius's fervent "Thank God!" when I read that no lives had been lost, since the mountain itself was entirely uninhabited.

That was the last of the beam, since the next elevation of land of any height was too far around the earth's circumference to come in range of the ray; therefore the impulse launched itself off into space away from the world.

Having at last secured an outfit adequate to measure light with accuracy, Lucius Raymond decided to make a number of tests that night. However, because of the destruction of the night before, he dared not focus the ray horizontally, so it was turned up to the heavens through a skylight, where it dinned and roared harmlessly. At least we supposed it harmless at the time. We couldn't know then what a boomerang this universe of power would become as we let it gush into the sky for hours! Hours and hours on end, when but a split second of its force could burst a hill and hurl a mountain!

That night I learned from Lucius of the speed of the ray. The proof of it was overpowering to me, so incomprehensible was its velocity. It made me know a fear I had never had before—the fear of a man-made monstrosity.

The Twin Ray first was measured, and we found that by some strange and unforeseen property of light its speed in this joining had been increased not once or twice, but by the square of its normal speed. The square of 186,000! One could scarcely believe it—34,596,000,000 miles in one second of time!

If it was that for the Twin Ray, then what of the Triple? That has never to this day been measured, for there is no instrument of man's capable of catching and recording its swift passage. Truly, it seems to be in two places at the same time, which of course is impossible. But though Lucius invented instruments of his own to measure as much as ten times the velocity of the Twin Ray, it was useless. However, I know that there was no shadow of doubt in Lucius's mind but that the third electrical ingredient gives a speed equal to the square of the Twin Ray. I do not know by what mathematical process Prof. Raymond arrived at this result. In his more abstruse calculations I was quite unable to follow him, as he worked with lightning speed and complete absorption, offering no explanation of any kind as he worked.

But this speed which later had so important a bearing upon Lucius's peace of mind was so far beyond comprehension that I will not weary you with the figures, as they would but string meaninglessly back and forth across the page and convey no impression to the mind. Enough to say that it would take nearly as many centuries as the world has existed for a ray of ordinary light to cover the distance the Triple Ray achieves in one second of time.

It is my greatest regret that I was called away on business which has no bearing on this narrative just at the time Prof. Raymond first perceived the tremendous interstellar effect of the vast ray discharge he had loosed. The first intimation I received was a short note from him delivered at my home. Upon opening it, I read, "Am going at once to Dudley Observatory. Have been advised of interstellar phenomena which, I fear, are results of our experiments," and at the bottom the familiar scrawled initials "L. R."

For some weeks I heard no more from Lucius Raymond. But ludicrously enough there appeared a great to-do in the meantime over an Englishman who was attempting to solve the atom. This I knew would not fail to catch Lucius's eye. Surely enough, in his first letter following his initial note, he remarked at length about it, and I was surprised at the bitter tone of his words as well as their hopeless undertone. I will insert here this much, to show the harshness which from that time on claimed my friend's nature.

"Do you realize, my friend, that it is years since we perfected our poor little, weak Twin Ray? I have, since working here at the observatory, learned that eight years is judged a long time between discoveries in the popular scientific world. I myself am indeed classed a failure, since no one has, of course, ever heard of the Triple Ray. Nor will anyone ever hear of it, save yourself, since while here I have made a discovery which is so portentous that I dare not face it myself until I have exhausted every experiment and possibility.

"It has been my reluctant duty while here to attend several so-called 'polite' social functions. And I find, when I am introduced, the same unuttered thoughts predominating, 'Poor fellow—a failure now—such a brilliant start—pity,' and after I have passed they join in little groups of two or more for a moment to say (for I once inadvertently overheard such a group), 'Yes—that's the man, wonderful work—atoms—priceless war instrument—but burned out now,' and they revert to the latest cinema sensation or divorce news. They give me their maudlin pity, when I alone must strive to save their skins from an ultimate catastrophe which I fear we loosed on the world that night with the ray through the open skylight. Damn their pity!"

Skipping further along through his letter, I will give his comments on the English scientist: "—and even today I saw Sir Ethan Slade's picture in the papers (taken at least ten years ago from the appearance) and read that the King of England has given him a medal; I don't know what sort, as I have no interest in such matters, simply for his 'great' work in unraveling the mystery of the atom. He expects shortly, by all accounts, to be in a position to release the power itself from the atom. I am half-minded to send him a cablegram of some half dozen or so words and tell him just

how to do so. But no, that would be merely a silly gesture. Let Sir Slade follow his own course to grief or otherwise, as time may decide.

"And writing of Sir Slade, I find the editorial writer has glibly picked up the old, worn-out phrases about "man harnessing nature's forces to his will," only this time it is "harnessing the atom's forces to man's will." Rot! I will say plainly, without mincing words, neither Sir Slade nor any other man will do any 'harnessing' of the atom. Indeed not! The conditions will be quite reversed. I *know*."

One not acquainted with the man could scarcely appreciate the revolt and repulsion with which he must have received this public pity. It galled him bitterly, and his consciousness of it colored all his later years when he lived as a recluse, the while working feverishly to discover some way to allay the catastrophe which he was convinced threatened our earth and its people.

My curiosity vastly aroused by his letter, I took the first opportunity to see my old friend and learn what discovery had so upset him. Of the truth of his contentions I will say nothing other than that in so far as I was able to follow him in his deductions and experiments every fact tends to bear out his theory. His first discovery at the observatory was that the tremendous energy released from the mountain lodge, while he was attempting to measure the speed of the Triple Ray, had formed into an interstellar ocean of destruction, rushing madly through outer space, engulfing all matter it encountered and converting it into its own destructive nature.

It was, indeed, in the very same lodge only a few days before his death that Lucius, flat on his back from two strokes which left him paralyzed below the waist, slowly and carefully explained to me fully for the first time the exact nature of his discoveries at Dudley. I will give this in his own words, since it is thus that I best remember what he said to me.

"I had always suspected that those cold caverns beyond the sky were not the straightforward vacuums they appeared to be. Had I given this a second thought that night, I would surely never have turned my ray upon them for hours as I did. I realized shortly my mistake.

"Within a few days astronomers noted an epidemic of hitherto unsuspected dark meteors near the earth suddenly bursting into flame, then dying out. After the meteors the epidemic spread to a few dead stars farther on, but still in relatively close proximity to the earth. In all my following of the astronomers their observations have covered a period of more than ten years. And in all that time I have been able to see the work my ray did in the smallest, the most minute fraction of its first second of existence. This is because the light from the exploding stars has taken such a time in its comparatively slow pace to come back to the earth, the source of the ray.

"It is for this reason that I cannot say how far in space the thing has traveled nor where it may be now. But this I do know and have proven many times over. The ray is traveling, not in a straight line after all, but instead in a closed circle, and must by every law of mathematics return again to its beginning. And since I have been able to learn by experiment that it renews and increases itself by that which it destroys, I have no particle of doubt in my mind but that upon its return to the earth our planet will be utterly annihilated.

"The circle is vast, I know, for it was months after I first began to trace its course on an astronomical map that I was able to detect the slight deviation of the arc. It must travel the very fringes of the known stellar spaces where it takes light a thousand million years but to cross. Yet so terrific is the ray's speed that it may carry it round and back, I fear, in a lifetime; perhaps less. And no sight of its return will give warning, since it precedes its own light as lightning seems to precede thunder. It is, in short, a natural force which will surely ride the universe until all active matter has come within its circle, as it must some time, and has been destroyed. And even then it will circle on when all time has ceased to be. Perhaps it will finally be the birth itself of a new and different universe. I do not know.

"And this strange curving of a straight ray into a circle; how to account for it? It is but recently that a daring scientist advanced a theory of 'spherical space,' whereby he mathematically proved that a straight line extended into the heavens will finally return to its source, even as a straight line extended upon the surface of the earth will do likewise. It is, you see, the nature of space and is inevitable. Safety alone lies in the immense circumference of this spherical void occupied by the stellar system.

"But I am sick to death of the sympathy of people I have no longer any pity for. Indeed, if I have failed, it is from being too successful. I have given up my search for an antidote to offset the ray's return, for I have concluded that there is none. The thing is invincible and once started may never be stopped. It becomes indestructible in its destroying power. A mad and unbelievable thing which nonetheless exists. I will not attempt to fight it longer. I am too tired. It is more than one man alone can do."

I left my friend Lucius Raymond then, with the light of genius burning dim in his eyes. And when I returned next day he was dead. A man whose success was failure, whose failure was success.

THE END

The Black Star Passes

By John W. Campbell, Jr.

(*Continued from page* 523)

the void of space. Long ages it would take to make this trip, but they need not worry on that score. Long ages had already passed as their dark planet swung through the void, what difference if they were accompanied by a dead star?

True, the star they were to go toward was a double star; their planet could not find orbits about it, but they might remedy that—they could hurl the one half of the star into the other, if they thought that best, or they might tear it completely free and make the star a single star.

But they would escape this dead sun.

THE END.

A Modern Prometheus

By Cyril G. Wates

(*Continued from page* 491)

away. As they descend the winding, flower-covered pathway from the Temple, the sun plunges into the ocean, flinging up a spray of silver stars.

Presently they come to a spot where two mighty palms raise their fronded heads into the night. Between them, almost hidden beneath a tangle of odorous Stephanotis, lies a tablet of white ferrolith, on which, in letters of Florium, a simple inscription is faintly visible in the gloom.

IN MEMORY
of
WAHKOLA KANA
Who was called Enceladus
"He gave his life for a friend."

Ralph's arm tightens around his companion.

"He did more than that, my Flower," he says, softly. "He broke the bonds of science and set the whole world free."

THE END.

Boomeranging 'Round the Moon

By David H. Keller, M. D.

(*Continued from page* 528)

it to him at the last moment, with the comment that it contained some final instructions in regard to the machinery. Tearing the seal off he read:

"My dear Mr. Hill:

"When you read about boomerangs, why did you not pay more attention to the fact that there were two kinds? One is a return and the other is a non-return. It all depends upon the curves of the surfaces. Frankly, I was tired of your constantly being between Dorothy and myself; so, I made the blueprints with the shape fixed so you never would come back. Good-bye. I hope you have a good time. "As ever, Smithson."

"That certainly was an oversight on my part," sighed Hill. "I guess I will sail around for a few years and then die. Poor Dorothy. I am sorry I quarreled with her last evening. She never will know how much I loved her."

"Yes, she will!" replied a woman's voice, and there was Dorothy.

"Oh! Sweetheart!" said Hill, taking her in his arms. "You ought not to have done this. Smithson put the curves the wrong way, and we are never going to get back to earth again."

"You mean we are just going to go on—and on—and *on* by ourselves, forever—just by ourselves?"

"Something like that."

"I think that will be too lovely for words, Henry," said Dorothy De Loach as she held him tightly to her and started to kiss him.

THE END.

Dr. Immortelle

By Kathleen Ludwick

(*Continued from page* 569)

cisco. There was no moon. The waters of the Bay were like a pool of black ink in which the vari-colored lights of the ships were reflected. To the south, a huge electric sign showed blood-colored through the smoke of some giant smokestack where men toiled in the sweat of their brows "to make the world safe for Democracy!"

A wisp of smoke from a passing steamer was wrapped around the Ferry tower, almost concealing it, and above it the light on its summit shone like a symbol of Hope; but the Germans bombed the Red Cross tent where Linnie ministered to the sorely wounded! Although I escaped alive from the hell of the Argonne, I lie here almost as helpless as Victor de Lyle when I saw him last, longing for the time when my soul shall be reunited with its mate.

THE END.

Editorials from Our Readers

THIS being your publication, you, the reader, have certain ideas, not only about this publication, but about scientifiction as well. The editors believe that their mission is complete when they select and edit stories that go into the making of this magazine. On the other hand, they feel that you, the reader, have a more detached view of the magazine itself, and that very often your ideas as to the magazine, and as to scientifiction in general, are not only valuable, but are original and instructive as well. For that reason it has been decided to print the best letter—about 500 words—which can be used as an editorial, on the editorial page and to award a prize of $50.00 for any letter so printed.

The letters which do not win the Quarterly prize, but which still have merit, will be printed in the "Editorials from Our Readers" Department, newly created in this magazine.

Laudatory letters containing flattering remarks about the stories themselves, or of the magazine, are not acceptable for the editorial page. We want inspiring or educational letters, embodying material which can be used as an editorial along scientifiction themes.

Remember, it is the idea that counts. A great literary effort is not necessary, as the editors reserve the right to edit all letters received in order to make them more presentable for publication.

Remember, too, that anyone can enter this contest.

This contest will end with the Winter Quarterly. Contest for next issue closes the 20th of the second month preceding date of issue —viz.—contest closing date for the next issue is the 20th of November.

Forecasts

WHAT will the world be like 100 years from today?

Such a question, familiar to all in these days of speculation concerning the future, was answered in a St. Louis newspaper, on February 19th, 1886, by an anonymous writer who gave a list of developments to be expected in that period.

His predictions appeared incredibly wild to his contemporaries—but already, less than 50 years later, one-third of them are commonplace matters with us. To this extent his list furnishes an object lesson in the practical value, for governments and corporations, of forecasts based upon shrewd and rational analyses of present trends.

Here is what he correctly forecast:

(1) Flying machines carrying heavy weights and freight; (2) general knowledge of world events on the day they occur; (3) distribution of the world's news, with sound and picture, through a Photophone; (4) formation of a League of Nations (yes, that is what he called it); (5) formation of a World Court to settle international disputes.

Now what did he predict that has yet to come true?

(1) Abandonment of roads, made unnecessary by aerial transportation; (2) aerial mail delivery by parachute at each door, and the elimination of post offices; (3) houses built of paper and equipped with aluminum and glass; (4) easy communication with other planets; (5) 94 states in the United States, stretching from Panama to Alaska; (6) complete abolition of standing armies; (7) amendment of the Constitution so that Congress meets once every ten years, and can pass no laws which may not be repealed immediately; (8) extension of average length of life to eighty years, with some individuals living to be 200 or over; (9) evolution of animals so that dogs may be made to think; (10) elimination of vagabondage with every one contributing to society.

These two lists are interesting objects of study.

In general, any forecaster is on sure ground in predicting inventive developments, for such developments seem to be limitless. The incidental *effects* of such inventions, however, are problematical. Our St. Louis writer correctly predicted aerial transportation—but his enthusiasm unbalanced his good sense when he anticipated delivery of mail by parachute! And although roads may be abandoned some day, it is doubtful if another hundred years, even, will find them entirely discarded.

When, however, any would-be forecaster begins dealing with government or politics, he should go cautiously, for, while each new invention or discovery in the field of material research results in two others, which in turn give rise to four, and so on, yet such a condition is not a characteristic of any society known to history. It is obvious to any casual student that the science of government has not improved in the same degree as the facility with which new inventions may be perfected.

Even more egregrious errors are made when the forecaster, carried away by a commendable—and, one may hope, justifiable—enthusiasm for the future of the race, predicts favorable developments in man's physical, mental and social nature. Even more remote, than in the fields of politics or government are the chances that predictions of such nature will come to pass within less than centuries. New inventions, new chemical combinations, have a direct commercial value that every man with money to invest is eager to promote, and these discoveries find direct and immediate application.

Improved laws, or beneficial changes in government are sometimes made after overcoming public inertia or private greed, but even then it is sometimes a matter of decades before it is certain whether or not they really do represent advances. But changes in the actual physical and mental constitution of mankind have in the past required long ages to take place—or else some fundamental alteration of environment, diet, or habits of living. Would the mere knowledge of the good results from such alteration produce the change? Not necessarily! Diphtheria anti-toxin will in time wipe out that dread disease of childhood—but there are innumerable parents who, because of religious sensibilities, fear, or merely slackness, keep this protection from their children.

Human beings are, according to their several natures, mean, lazy, noble, industrious, kindly, cruel, savage, mild. Thus they have been for uncounted ages, and thus they will remain for ages to come unless—what?

A year or two ago a magazine writer hazarded the query whether the age of superdevelopment in mechanical and material matters would not be succeeded by an equally astonishing development of experiment, knowledge and achievement along lines of human betterment—of the relations of one man to another, in every aspect of his daily life.

This is an arresting thought. The age of the Romans was one of conquest and consolidation. When the world finally readjusted itself after their empire had crashed, its energies were absorbed in discovering and developing new lands in an age of exploration. The age of invention followed—and now perhaps we are about to enter the age of humanity. But it will take the entire energies of our civilization, now bent with every fibre to the conquest of matter in all its material forms, to achieve the slightest victory in the war on "man's inhumanity to man."

And if this writer may be allowed a prediction of his own, it will not be until the problem of universal, inexhaustible, free-as-air power is solved, that the full force of the genius of mankind will be devoted to solving the even more difficult problem of guaranteeing "life, liberty and the pursuit of happiness" to every living creature. And whether that day dawns soon or late, in one decade (as it might) or in ten times ten decades, dawn it will, unless the folly of man shall have plunged his own civilization into wrack and ruin by the cleverness of his creative genius.

FREDERICK M. CLOUTER,
104 Greaton Road,
West Roxbury, Mass.

Ad Astra Per Aspera

"SILENT upon a peak in Darien," stout Balboa, the pioneer, gazed upon an undreamed-of heritage vaster and of greater variety that the boldest mind could have realized, and so it is with the whole world today. We have a great and high destiny before us, a realm of power and splendor of which we know but the border, the resources of which we cannot guess, any more than the Piltdown man visualized television, or the luminous creatures of the ocean deeps think of the glories of the upper world actually above them. More than to any other branches of literature, with their tales of past and present, the future is the happy-hunting-ground of scientifiction. It has a dual purpose, that of warning against misuse of power and that of pointing the way—to the stars though the way be rough. It is unfortunate, however, that so many authors of scientifiction seem to revel in the grotesque, in wars, in the unbeautiful, in absurd caricatures of men, in a wider scope for brutality. Surely, the aim of scientifiction, should be the dissemination of idealistic hope, as well as the warning. And even those who gratify our eternal springs of hope with Utopias, still confine them to limited areas, to remote distances and other restrictions. There is a legend that far away is a great rock, a cube of one hundred miles, upon which, once in a thousand years, a little bird wipes its beak. When the rock is worn away, an instant of time has elapsed. Since the earliest dawn of civilization, the rock has been visited ten times. Undeniably in that short time many evils born of ignorance have been eradicated, and many ideals realized by knowledge. It is not unreasonable to expect this to continue, accelerating even, until the rock is worn away, then will the ultimate star of our heritage be attained. Therefore let us have stories of hope, not for bounded localities or distant worlds, but for the whole of our own planet and every individual upon it, when the time comes. Let us have stories of the science which shall achieve this, let us have stories of beauty, romance, and peace, let us always keep as our watchword, "*Ad Astra Per Aspera.*" To the stars, though the way be rough.

Howard M. Stabbs,
Inwood, Manitoba, Canada.

HOW TO OBTAIN
A Better Looking Nose!
Improve your personal appearance

My new Model 25 Nose Shaper is designed to improve the shape of the nose by remoulding the cartilage and fleshy parts, safely, and painlessly. This is accomplished thru the very fine and precise adjustments which only my patented Model 25 possesses. Results are lasting. Can be worn at night, or during the day. Money refunded if not satisfied after thirty days' trial. Write for free booklet to

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Dept. 151 Binghamton, N. Y.

The Most Interesting Evening I Ever Spent

UP TILL 9 o'clock the party was a complete flop. Then Tom walked in. Tom's a live wire, if there ever was one.

He said he'd heard about a one-man show anyone could perform with the help of a book he knew about. He had sent for that book, and said he was going to put on the show.

We thought he was joking and laughed at him, but he sat us all down in the living room, got out a pack of old playing cards, and started to do things that made our eyes pop out of our heads.

For over 2 hours he made those playing cards almost talk. What he could do with those cards just didn't seem human. After it was all over, the gang all crowded around, shaking his hand, and patting him on the back. The girls all said, "Oh, Tom! You're wonderful!" It was by far the most interesting evening I had ever spent.

I asked him how he learned it all. For answer he pulled out a shiny new quarter, and said that one just like it had taught him every trick he had showed us.

And it was a fact! Tom had simply enclosed a quarter with the coupon below, and gotten Walter Gibson's Famous Book of Popular Card Tricks by return mail. You, too, can entertain yourself and your friends with the 101 card tricks it teaches. No sleight of hand is necessary—no hard work to learn. Simply read the book carefully and you can do every trick in it.

And it costs only 25c! Send for it today. The demand is great, and we only have a few hundred on hand.

MAIL COUPON BELOW!

Radio-Science Publications, Inc.
Dept. 2210, 381 Fourth Ave., New York, N. Y.

I enclose 25c (in stamps or coin) in full payment for Walter Gibson's Book of Popular Card Tricks, which, it is understood, will be sent me by return mail.

Name .....

Street and No. .....

City ..... State .....

Your Viewpoint

Notes on the Spring Quarterly

Editor, AMAZING STORIES QUARTERLY:

As a regular reader of AMAZING STORIES since No. 1 of Vol. 1 first made its appearance, I am for the first time submitting my opinions. The first part of the above sentence is sufficient proof that my general opinion is exceedingly favorable, although I have my pet peeves and partialities.

I have just finished the SPRING QUARTERLY, so I will confine my criticisms to it. Incidentally, these criticisms are purely personal ideas, as my scientific knowledge closely approaches zero as a limit.

"After 12,000 Years" certainly adds nothing to the good reputation of Mr. Coblentz as an author. After a fair start, he drops the scientific side entirely, leaving merely an old plot, poorly held together. It makes a poor foundation for his satire of possible evolution from the present types.

Apparently there has been no advance in science outside of the entomological field, except for skipped over mention of tide harnessing machinery and the description of their vehicles. That, and the illogically operating machines for testing the body, are even worse than Wells in "The Sleeper Awakes." Considering the present trend of power and engineering toward electricity and its kindred forces, I can not imagine the general use of internal combustion engines of a type apparently but slightly advanced from the present, even 1,200 years hence, much less 12,000. But I'm wasting time. My summary is simply that the story is entirely unworthy of its author.

"Locked Worlds" is rather unique, offers many possibilities and could have an interesting sequel.

"The Cry From the Ether" is excellent, though I hesitate to call it better than "The Beast-Men of Ceres." Too bad Septama is only human, for with his present quality I could read much more than he could write, and I venture to say that I share the general opinion.

"The City of Eric" is quite good and should produce some really interesting sequels.

The only small flaw which I shall mention is not in the stories, but in the comment upon our (readers') opinions.

It is rather amusing to note in the comment on the letter of Clifton ——— that the Editor says in closing, "However, there is one remark we must make which is that science is advancing, changing from day to day, so you should not be so positive in your points of view." On the next page, answering the letter of Donald G. Allen, and speaking of making artificial diamonds, he concludes with: ". . . and certainly one of any size could not be made artificially." Considering the nature of the subject, it is quite apparent that "at present" and "can" should be substituted for "certainly" and "could," even without his own previous admonition.

This is enough for one waste basket, so I'll sign off after asking what has happened to the authors of "The Moon Pool" and "Skylark of Space," the two best stories you have ever published?

Robert S. McCready,
3120 Warder St., N. W., Washington, D. C.

(This letter speaks for itself. We only have to say about the making of a large diamond artificially that the word "could" takes care of the statement just as well as the amended version which you suggest. Under present conditions of knowledge, a large diamond cannot be made artificially. The word "could" is not a future auxiliary. There are many more stories coming by the authors you like.—EDITOR.)

Suggestion About Artists

Editor, AMAZING STORIES QUARTERLY:

I have just finished reading the Summer edition of your AMAZING STORIES QUARTERLY. I have no complaints to make. The paper used was very good and helped make AMAZING STORIES better. Just a word about your art staff. I noticed several drawings in the Quarterly by different artists, but none by Paul.

I would like to suggest to you that you try and procure the services of:

John Richard Flanagan, the illustrator of "The Day the World Ended" in Colliers Weekly. I am sure that you will like his work.

D. Friedman,
675 E. 170th St., New York, N. Y.

(We are delighted to hear criticisms of our different artists. We are gradually getting together a staff of men whose work we believe will do justice to the very excellent literary productions of our authors. The many letters we receive tell us that AMAZING STORIES is liked by our readers. They like the illustrations and the general get-up of the magazine, so we will be very slow about making any change except when we feel assured that it is for the better.—EDITOR.)

A Lot of Criticism of the Cover Illustration of the Quarterly

Editor, AMAZING STORIES QUARTERLY:

I take the attitude of lots of the readers who write you in regard to the cover of AMAZING STORIES. I think I can tell you exactly what it is that they want in a cover. My experience as a newspaper and magazine editor, student and a reader of your magazine puts me in a little better position to explain myself than most readers, I presume.

I find that I, and the other average persons want art, color, and the medium combination in a cover. They are with a cover on this type of a magazine as they are with a lady: In a lady, they admire color, combination, and just enough flapperish to sweeten 'em: in AMAZING STORY magazine, they want color, combination, and just enough gaudiness or loudness to sweeten it.

Looking at the magazine from the street show window, if one's not acquainted with the high-class articles inside, one naturally thinks that he's running into a cheap brand of hair-raising articles covering crafty murders, and amazing stories of life, not so much advanced from the "Diamond Dick" and his day class.

Yes: I think as some of your readers: The cover doesn't give credit to the high class scientifiction inside. The class of people who read this magazine are conservative business men, students, knowledge-thirsty youths, scientists and the deeper and saner men of the world. They don't want something too bizarre or gaudy-looking when they purchase a magazine to be used and seen in their offices and homes.

I am herewith enclosing some pen and pencil sketches to better illustrate just what I mean and just what I think the cover-complaining readers, who have written about the matter, mean.

I've been a little exacting in the drawing of number one, but I think the coloring and ornaments help the eye to grasp the whole thing better. With a three or four colored picture similar to some of the late editions of the magazine, with a two color name-plate across the top, and with the authors' names in black or dark color on a white background I think you would have a combination of beauty and art to please anyone. Just the little matter of giving a margin between the edge of cover and picture robs a cover of some of its "cheap" look.

I think a vote of your readers would show possibly 75 per cent. favoring the word "Scientifiction" prominently displayed with the regular head. "Scientifiction" would be a far better name for the magazine, but it's now too late to fret about that—and I'm supposed to be "suggesting" covers only.

Change of prominent colors; from a vivid hue one month to a somber or milder hue, or even dark featured, the next month—in connection with a few permissible movements and changes of forms—would give a very vivid and pleasing individuality to each month's cover.

A big change could be made by shifting a little. Another noticeable difference could be made by putting the names of authors on white margin below "cut" and using all of upper space for picture or "cut"—and giving it a generous margin all around.

I feel that such a change as I've penned here would give your readers just about what they want. I am the average reader and that's what I want.

I hope these suggestions are accepted in just the mutual way I have offered them.

N. E. Knapp,
Alliance, Nebraska.

(We have an excellent staff of artists and they are personally interested in the particular type of work, which AMAZING STORIES exacts. Your sketches are very interesting and suggestive. The primary idea of the cover is to attract the eye of the observer, who is looking at the multitude of magazines displayed on the news-stands. The greatest attention is given to the art value of the work, and it is criticized vigorously before acceptance. You have probably noticed that our covers of recent issues have been far from lurid or gaudy in coloring. The illustrations on the cover are in the fullest sense exact in detail and scientifically correct.—EDITOR.)

FREE

This Big Book of "POPULAR CARD TRICKS" with 6 months of AMAZING STORIES All for Only $1

Read This Account of the Most Interesting Evening We Ever Spent

UP till 9 o'clock the party was a complete flop. Nobody seemed to be able to get things going. Then Tom walked in. Tom's a live wire, if there ever was one.

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For over 2 hours he made those playing cards almost talk. Amazing predictions, mysteries, thought anticipations, invisible passages, etc.! What he could do with those cards just didn't seem human. After it was all over, the gang crowded around, shaking his hand and patting him on the back. The girls all said, "Oh, Tom! You're wonderful!" It was by far the most interesting evening I had ever spent.

We asked him how he learned it all, for we knew he didn't know a single thing about card tricks a short time before. For answer he said that he had discovered Walter Gibson's Famous Book of Popular Card Tricks and it had taught him every trick he had showed us.

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